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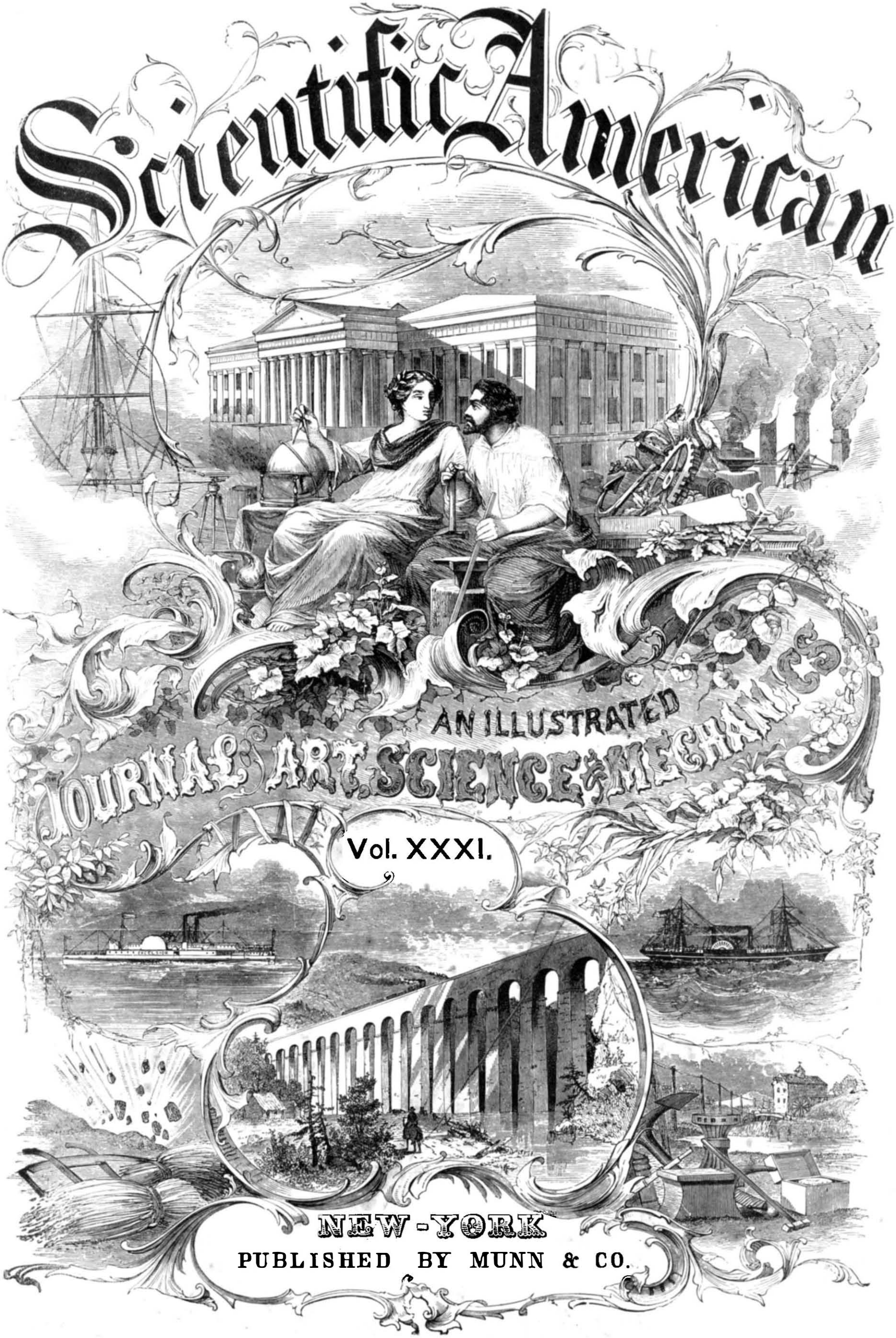

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Vol. XXXI.

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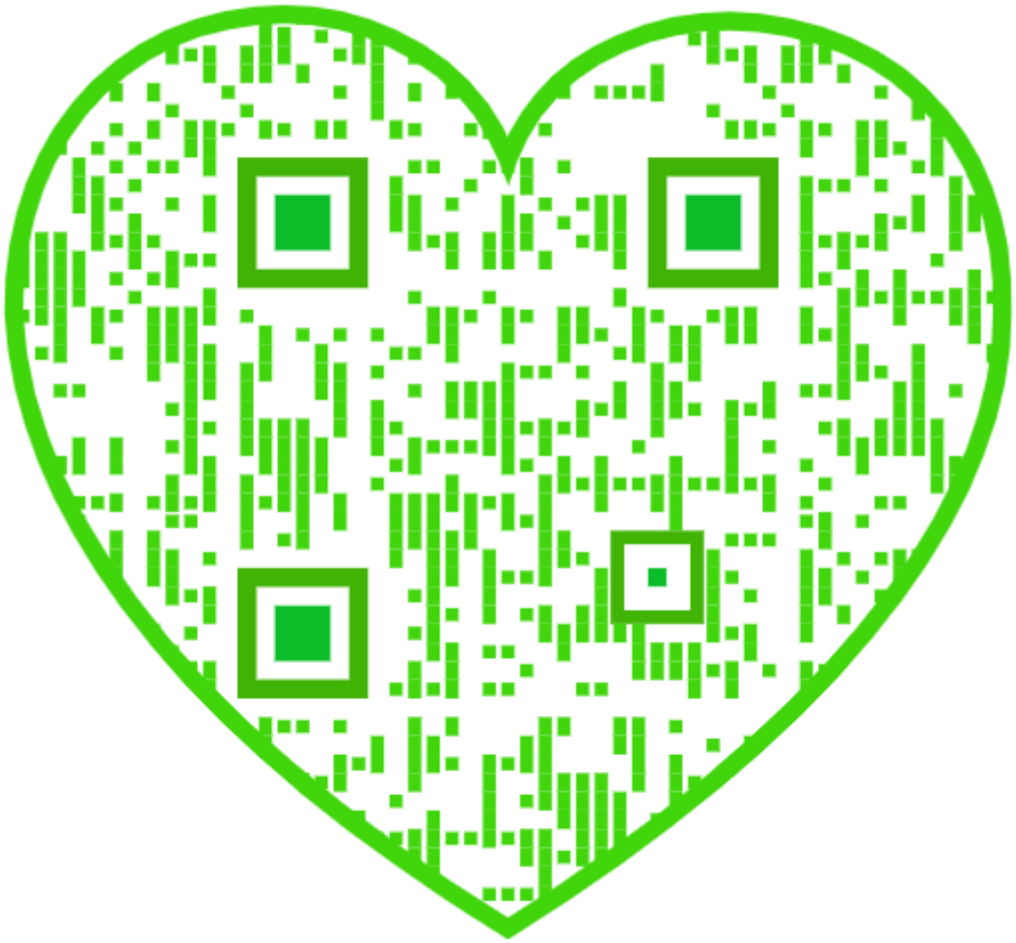

SCIENTIFIC AMERICAN

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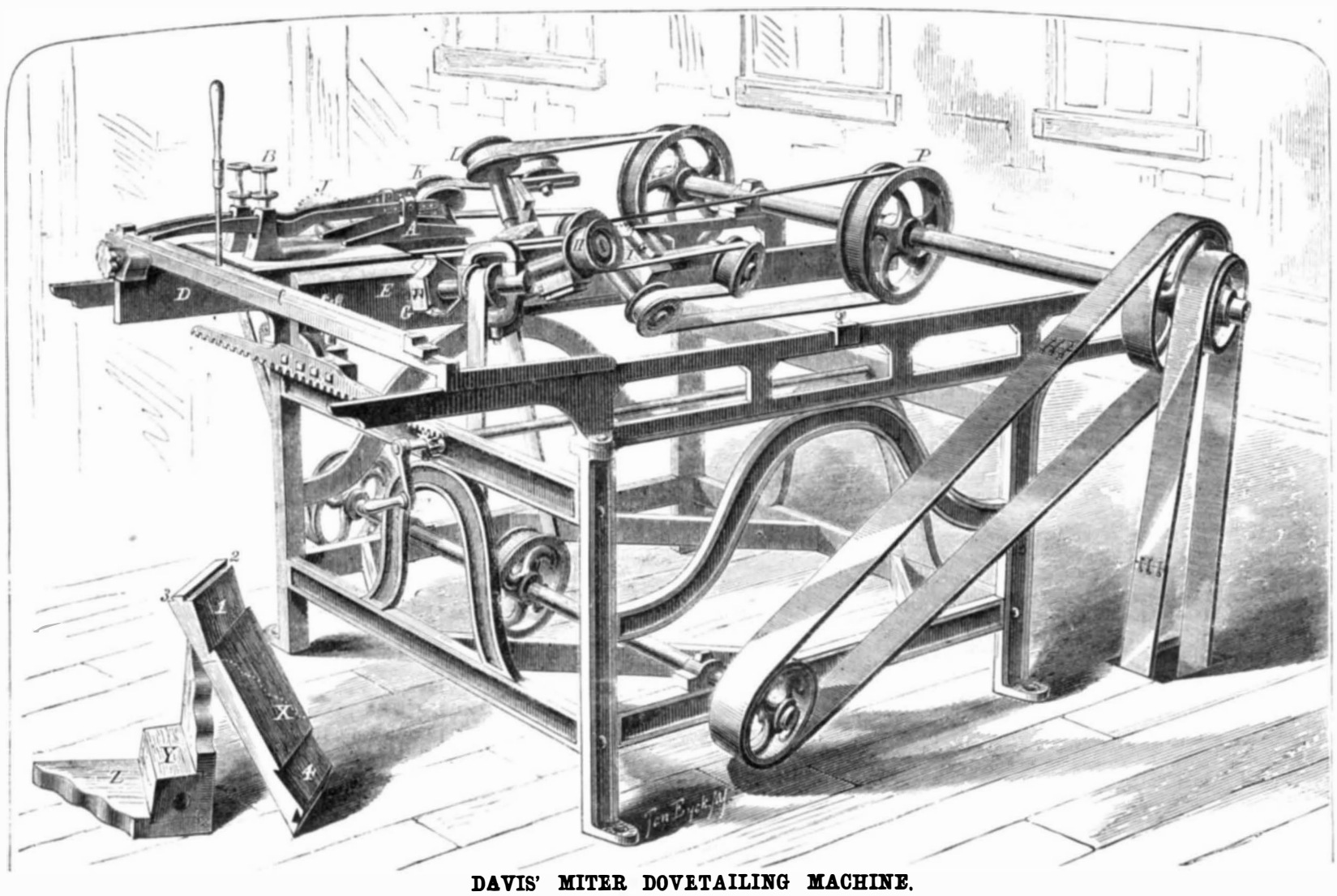
Vol. XXXI.—No. 1. [NEW SERIES.] NEW YORK, JULY 4, 1874. [$3 per Annum. IN ADVANCE.

IMPROVED DOVETAILING MACHINE.

In 1839 Ari Davis obtained a patent for a machine for making a miter dovetail joint. Upon that device, within a few years, improvements were made and also patented. These were followed by other modifications, added by Mr. Asahel Davis, the brother of the inventor, each augmenting the capacity of the apparatus, and all ultimately uniting in the production, at the present time, of the machine which forms the subject of our engraving and of the following description.



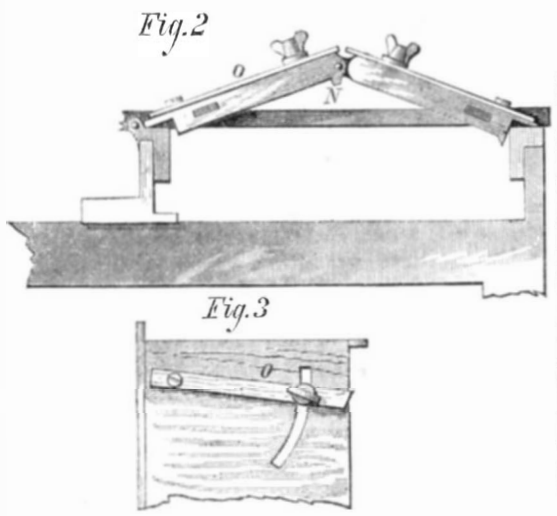
DAVIS' MITER DOVETAILING MACHINE.

In briefly summing up the capabilities of the device, we may state that it cuts to length and squares and dovetails both ends of the boards operated upon, at once, requiring them to be passed through but a single time. It can be changed for different length of stock while running, as easily as the guide on a saw bench. The dovetailing is accomplished on any bevel, angle, or flare, with great accuracy, and a rabbet or groove is also cut for an inside corner. It is claimed that the machine will prepare boards so as to make from six hundred to one thousand cheap boxes per day of ten hours, doing its work in cross-grained or knotty lumber as well as upon clear stuff, and with very little more expenditure of time. It is well adapted for casket and coffin work, ornamental box work, and for the manufacture of trays, hoppers, moldings, picture frames, cornices, patterns, and, in short, of all flared and many-sided objects.

Referring to our illustration, Fig. 1, at A are feet which serve to hold the board to be operated upon firmly in place. These are connected with levers which pass through standards, and the play of which is regulated by the set screws, B. In order to raise or lower the feet, so as to place or release a board, the outer lever arms are connected with a cam bar, C, to which a handle is secured. By carrying the latter from a vertical to a horizontal position, the bar, C, is turned, thus raising the lever arms, and so forcing the feet firmly down upon the work.

The board rests upon traveling ways, one of which, D, moves upon the outer portion of the frame of the machine. The other moves upon the frame, E, which is arranged upon a support having a motion transverse to the apparatus, so that the ways may be adjusted to suit varying lengths of boards to be cut. This adjustment is effected by means of a horizontal rack connected to the moving frame, in the teeth of which engages a pinion rotated by the crank, F. Upon the bar of the frame, to which the pinion is secured, is marked a suitable index, by means of which accurate adjustments may be made. The cutters and tools upon the moving frame are actuated by the pulley, P, which is arranged to slide freely along while revolving with its shaft.

The board being placed as we have described, is carried over the machine in the direction from left to right in the engraving; and during its passage both of its ends encounter certain cutters and saws, which form it in the shape represented in the portion, X, shown to the left, on the floor. To understand this operation, it is necessary to consider the action upon each end separately, and therefore we will begin with the upper extremity of the board, as represented beside the machine. This, it will be observed, has the male portion of the dovetail, which, when being cut, rests upon the traveling piece on the frame, E. As the stuff is carried along, it is first met by the cutter, G, which forms half the inside dovetail, which is marked 1, in the sample piece, X. A second cutter on the arbor, H, then makes the lower half of the male dovetail of the miter joint, marked 2. At I, a saw and cutter are so arranged that the former cuts off the



board and thus determines the length of the male portion of the dovetail, while the latter, a thick tool, forms the other re entering portion, 3, thus finishing the end.

The other extremity of the board is first met, as before, by a cutter similar to G, which makes the other half of the inside dovetail, 4, then by a saw, J, which cuts the end to the proper miter. A tool at K next forms the upper half of th female dovetail, and another saw, at L, finishes by making the lower half of the same. If now the piece, X, be cut diagonally in two, in the direction of the spiral dotted line, and its dovetailed ends fitted together, a third piece, Y, slipped into the inside dovetail, formed by 1 and 4, completes the joint, which appears as in the second sample piece, Z.

All the various heads belonging to the cutters which we have described are arranged with set screws, so as to be adjustable to cut the dovetails deeper or wider, and in order to compensate for wear.

In Figs. 2 and 3 is shown an attachment for guiding boards at suitable inclinations to the saws, so as to be mitered to any desired angle. This consists in a table, N, hinged in the middle, the angle formed by the parts of which becomes greater or less as the movable way is carried further from or nearer to the stationary one. The board laid upon the inclined surface is presented to the tool at the angle to which the table is adjusted. In order to cut the edge for flaring work, such as hoppers, caskets, etc., after the table, N, is placed in position, the location of the board may be altered so that the miter is made diagonally instead of straight along the end, by resting the piece against a guide, O, Fig. 3, which is locked in place by a set screw, which passes through a slot in the table.

The machine represented is claimed to be well adapted for the joinery of flasks, ordnance boxes, feet for furniture, and ice chests. For samples of the joint which it makes, the inventor refers to the refrigerators made by Messrs. L. H. Mace & Co., of this city, which may be found in the stock of almost every hardware dealer. The principal improvements of the machine were patented May 19, 1874. For further particulars, address Mr. Asahel Davis, 16 Middlesex street, Lowell, Mass.

A POWER SUPPLYING COMPANY.—The Rochester (N. Y.) Hydraulic Company is an incorporated institution owning more than half a million of dollars' worth of real estate; it carries on no manufacture, but rents its buildings to various manufacturers, supplying the power to them from the water flowing in the river beside the shops. A short time ago the rock was cut so as to make a deep well, and two of the largest water wheels, yielding over 1,000 horse power, were placed therein. It is the intention of the owners to add another wheel, which will swell the power attained to over 1,500 horse power.—*Commercial Bulletin.*

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HOT WEATHER AND HYDROPHOBIA.

Dog days are sorry days for dogs. Not that the sultry season brings any distemper to them, least of all hydrophobia; but it does to Dogberry. As surely as warm weather returns, so surely are petty magistrates all but universally smitten with a sort of caniphobia, which knows no remedy but that instrument of canine torture, the muzzle. How the delusion originated, there is no telling. It is equally hard to tell how it survives in the face of experience, statistics, the protests of the intelligent, everything, in fact, that ought to influence the official mind.

The canny juryman had twenty-three good and sufficient reasons to offer for the non-attendance of a brother juror. The first was: "The mon's dead, y'r honor." Reasons as numerous if not as cogent may be given for opposing the law that dogs shall not be suffered at large without a strap over the nose or some similar device for closing their mouths, at the time when an open mouth is most essential to their health and comfort. It is enough to say that the enactment is useless as a precaution against danger from canine madness.

Dogs do not go mad in public places. For hours, perhaps days, before the outbreak of the disease, the victim skulks within doors, hiding in dark places, under furniture, in mangers, and the like. Unless the muzzle is insisted on as a permanent fixture, therefore, it is no safeguard whatever. The distemper is developed at home, where the muzzle is not worn, and the rabid animal escapes to run amuck at a stage when muzzling is impossible. Besides, the dogs which do the most mischief are commonly pets, house dogs, and stable dogs, not allowed at large, and therefore seldom or never subject to municipal supervision.

To make the regulation really effective, it would be necessary, as already intimated, to require all dogs to be muzzled at all times, night and day, in doors and out, the year round. As a matter of mercy to the poor brutes under such circumstances, as well as to ensure perfect security from dog bites, we should recommend that the muzzle be riveted to the *os frontis*, or, better, to a steel disk three or four inches in diameter passed between the cervical vertebræ. This would necessitate the throwing away of the larger part of the dog, we admit; still as a precaution against hydrophobia it would be absolute, and the animals would be free from the useless torture incident to the common method of muzzling.

Seriously, while it would be a blessing to the community if four out of five of the canine population were thus effectually muzzled, we have no hope that so practical a measure will ever be carried out. To the end of the chapter the complaint will be heard—too many dogs. And so long as there are dogs there will be mad dogs, and dogs that will bite without going mad, with equally bad consequences to the victims. Not until common sense and knowledge take the place of ignorance and superstition in the treatment of dogs and dog bites, will the risks of hydrophobia in man and beast be measurably abated. The precautions adopted must be of the right kind, and taken at the right time, else they are useless or worse; and above all, people must cease to trust to measures of prevention and relief which are demonstrably of no effect.

First of all, it is needful to overcome the popular belief that there is any necessary connection between hot weather and hydrophobia. The fact is that canine madness, technically *rabies*, is more prevalent in winter than in summer, in cold countries than in warm. Readers of Dr. Kane and other arctic explorers will remember the frequency of the disease among sledge dogs in the depths of arctic winter. On the other hand, in the West Indies, where the climate is hot and dogs are abundant, the malady is rare. The Southern States and the countries of Southern Europe are notably exempt from it; while it is very common in Northern Europe, in Canada, and throughout our Northern States. Statistics show also that more animals go mad in January, February, and March than during any other season, the fewest cases occurring in summer time.

It is also a mistake to suppose that hydrophobia always follows the bite of a mad animal, or is necessarily caused by such a bite. Between 1863 and 1868, there were 320 persons bitten by rabid animals in France, and hydrophobia ensued in only 129 cases, less than half. According to Faber's statistics, out of 143 persons bitten by rabid animals in Würtemberg, only 28 had hydrophobia. Hertwig inoculated a large number of animals with the saliva of rabid specimens, and succeeded in communicating the disease in but 23 per cent of the animals operated on, 77 in the hundred escaping.

In view of these facts, it is impossible to come to any absolute conclusions in regard either to the conditions of the disease or the adequacy of measures adopted for its prevention or cure, since there is always a degree of uncertainty as to what the result would be were nothing done. Still we are not wholly in the dark. From the French records, it would appear that wounds in the face and throat are most dangerous, nearly all those reported terminating fatally. From bites in the hands, hydrophobia ensued in two cases out of every three: while of those bitten in the legs, two out of three escaped the disease.

So far the statistics seem to favor the common belief that the greater immunity in case of wounds in the legs is due to the protecting effect of clothing; but the fact that bites on the body, which is always clad, result in hydrophobia as frequently as bites in the hands, which are commonly bare, puts a different face on the matter.

Possibly clothing may serve somewhat to prevent the flow of saliva into the wound, and the saliva seems to be the bearer of the virus; but the circumstance that five thicknesses of cloth have been bitten through with fatal effect should prevent any great reliance on so uncertain a safeguard.

Nor should speedy action be neglected from any doubt as to the health of the biting animal. Hydrophobia has frequently resulted from the bite of animals showing no symptoms of rabies. Dr. S. G. Cook described a case of this sort in the *Journal of Psychological Medicine*, January, 1871, and called attention to another fatal case of the same kind which occurred some years earlier. In these cases, both of which occurred in this city, the biting animal was a bitch, in "heat" but otherwise in normal health; and Dr. Cook raises the question whether the bite of an animal in that condition may not always be specially virulent. Further observation must determine the justness of the suspicion; meantime extra caution would be advisable in such cases, even to the extent of preventing any licking of the hands or face by such animals, hydrophobia having been communicated by such seemingly innocent means, when the skin happened to be broken.

It is well to be extremely cautious also of dogs (or cats) which are unusually irritable, or which manifest other unusual symptoms, especially in regard to eating. Long before the dread of water appears, the approach of rabies is shown by a morbid appetite, which impels the ailing animal to devour filth and other obnoxious substances

If valuable, the suspected animal should be promptly and securely chained in a place convenient for its execution should rabies be developed; if worthless, killing cannot be too speedy, whether a disposition to snap at persons or things has shown itself or not. In all cases of doubt, the animal's stomach should be examined, as well to relieve the apprehensions of the bitten, should the bite be probably harmless, as to ensure thorough treatment of the wound in case hydrophobia is threatened.

The following substances were found in the stomach of a suspected dog, and were held to be strong indications of the animal's madness: Hair, mud, two bumblebees, a large butterfly, a small white mushroom, straw, grass, and a small piece of the victim's cheek!

The bitten child was treated by Dr. de Marmon, of Kingsbridge, New York, apparently with perfect success. The treatment consisted chiefly in the prompt cauterization of the wounds with a saturated solution of carbolic acid, afterwards keeping them wet with a weaker solution, accompanied by internal doses of *liquor ammoniæ*.

In all cases of dog bite, cautery should be resorted to immediately. If possible, a ligature should also be applied and the surrounding tissues drained of blood by means of cupping glasses or otherwise. Of the French cases already mentioned, 134 were cauterized, more or less promptly, and 92 escaped. Of 66 who neglected the precaution only 10 escaped. Sometimes simple excision of the wound appears to be effective, an operation which Dr. Hammond of this city has performed half a dozen times for wounds received from animals certainly rabid, and always with success so far as heard from. In four other cases he used caustic, with apparently the same effect. Mr. Youatt (author of so many works on dogs and other animals) relied entirely on the caustic action of nitrate of silver. As he treated as many as four hundred cases of bites by rabid animals, always with success, his experience is certainly worth considering. Four times he had occasion to perform the operation on himself; but there is a probability of its failure at last, since he committed suicide while suffering from what were supposed to be the initial symptoms of hydrophobia. Niemeyer advised both excision and cautery, in addition to cupping, as the most promising means of removing or destroying the virus; and in view of the horrible and fatal character of the disease, these precautions, however heroic, would seem to be justifiable. This is one of the cases in which prevention is not merely better than cure, it is the only cure. Once the disease has declared itself, there is little hope save that its more horrid symptoms may be mitigated, and the patient allowed to die in something less than agony.

Cure there is none, though the resources of medicine have been exhausted to find one. True, every now and then some one proclaims a specific, but unhappily the first genuine case of hydrophobia usually proves its inadequacy. Hot air is the latest remedy proposed; it appears, however, to be a delusion, since we recall at least one case in which the Turkish bath seemed only to aggravate the victim's agonies. Nevertheless, in his work on the diseases of the nervous system, Dr. Hammond says that, in the present state of knowledge, he would be more disposed to rely on the hot air bath at a temperature of about 200° Fah., with the administration of hydrate of chloral in large doses frequently repeated, than on any other plan of treatment, apparently for the reason that the plan had never been tried, and therefore might possibly succeed. At least he cites no cases of such treatment, though he refers to the case treated by Dr. Cook, already mentioned, in which the Turkish bath was proposed, but, owing to the parent's objections, was not tried. The only remedy employed was chloral, hypodermically injected, which, though tardily used, greatly mitigated the severity and frequency of the spasms. The child died, but remained conscious to the last, and showed no disposition to injure himself or others.

Perhaps the most encouraging case of mitigative treatment on record is one reported not long since by Professor Polli of Milan. The subject was a man who had been bitten by a mad dog about a month before, the symptoms of hydrophobia being fully developed when the experiment began, twelve hours after the patient's admission to hospital. The remedy employed was hachish, in 8 grain doses of the solid extract repeated every four or five hours. The effect was immediate and happy. Convulsive madness and fury gave place to good humor, even gaiety, and for forty-eight hours the patient lay on his bed free and tranquil, then died calmly. The horrid symptoms of the disease were thus almost entirely removed; a result accomplished neither by opium nor morphine, nor by daturine. "Hachish," concludes Professor Polli, "is therefore the best palliative and sedative in hydrophobia. It changes a raving, unmanageable, suspicious, or aggressive maniac, who bites and curses, into a poor invalid, content and tranquil, who blesses you."

A very recent and somewhat remarkable case is that of the late Dr. Francis Butler, of Brooklyn, N. Y., who died of hydrophobia June 16. He was an educated man, the author of a book upon the breeding and diseases of dogs, and of late years had made the training of these pets his especial occupation. He was almost a total disbeliever in the reality of the transmission of any poison or disease from animals to mankind. He entertained the view, promulgated by Dr. Brown-Séquard and others, that hydrophobia in man is simply a nervous disorder, brought about by the imagination. In his various publications, Dr. Butler has given many directions about the proper treatment of sick and mad dogs, and has shown how easily all persons when bitten might cure themselves. His sad death proves the fallacy of his principal theories upon the subject. About six weeks ago he received a sick dog for treatment, and, in an attempt to administer his favorite remedy to the animal—salt—was bitten upon the thumb; the wound was slight and soon forgotten. On the day preceding his death, when in the act of placing a cup of tea to his lips, he was seized with dreadful spasms, which, with intervals of calmness, increased in intensity. He rushed about his house, he barked like a dog, while streams of foaming saliva spurted from his mouth across the apartment, propelled as if with the force of an engine. It required the efforts of several strong men to hold him. He was attended by skillful physicians, whom he implored to take his life and release him from agony. Every effort was made for his relief, but neither by the stomach nor the hypodermic method was it possible to apply medication. During the last hours Dr. Lorette succeeded in forming a blister on his breast with mustard, and on this abraded surface of the skin he dusted sulphate of morphine. In ten minutes the drug acted on the patient's system, the opium delirium came on, and he died without further suffering, exclaiming toward the last: "Oh! I am in heaven!"

Dr. Carnochan, one of our most eminent physicians, in a recent case of this awful malady, recommended the use of the tincture of Calabar bean. Its good effect was immediataly seen, and the doctor thought there might have been a recovery had it been sooner applied.

THE NEW COMET. COGGIA.

Our new celestial visitor, which may be now discerned in the northern heavens, is daily increasing in brilliancy, and will soon be a very conspicuous object. The discovery of this body, known as Comet II., 1874, was made by M. Coggia, at Marseilles, on April 17 last. It is wholly without the earth's orbit, but is gradually drawing nearer to our sphere. The circumstances under which the comet appears are very favorable for spectroscopic examination, and hence the scientific world will look eagerly for results which will

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give us a further insight into the physical nature of these celestial vagrants.

Rating the light of the new comet at 1 at the time of its discovery, its progressive increase in brilliancy will be as follows:

July 2.....	17·8	July 26.....	146·3
" 10.....	32·3	Aug. 3.....	245 0
" 18.....	64·8	" 11.....	130·0

From the investigations of Secchi and Huggins upon Tempel's comet, it was found that the nucleus is partially self-luminous and composed of gas in a luminous condition, containing carbon. Nuclei, beside emitting their own light, reflect, with the coma and the stars, the light of the sun. Hence the latest theory is that the comets are composed of minute solid bodies, like a cloud of smoke or dust; and as the mass approaches the sun, the most easily fusible constituents become wholly or partially vaporized and in a condition of white heat, overtake the remaining solid particles, and surround the nucleus in a self-luminous cloud of glowing vapor. It should be remembered, however, that our positive knowledge on the subject is very limited, and that the above is merely a hypothesis which, to a certain degree, accounts for observed phenomena. Tyndall has put forward another theory of great ingenuity, founded on physical experiment, in which he regards the tails of comets as resulting from the formation of a species of actinic cloud by the action of the solar rays after their character has been altered during their passage through the comet's head. Zöllner considers that the small comets are masses of vapor consisting of water or perhaps of liquid hydrocarbons, an idea which is fortified by the character of certain nebulæ. He also believes that the electricity developed by the solar rays, either in the process of evaporation or by the molecular disturbances they pro duce, is amply sufficient to cause the luminosity and also to form the train.

The length of comets' tails is rarely less than 500,000 and often reaches 150.000,000 miles. The breadth of that of the comet of 1811 was 14,000,000 miles, and the comet of 1828 had a nucleus 528,000 miles in diameter.

PROTECTION FROM FIRE.

A recent amendment to the building laws of New York city provides that every dwelling occupied by more than one family above the first floor, including all hotels, lodging and boarding houses, shall be provided with fire escapes, doors, and alarms. Stores, warehouses, or other buildings, except dwelling houses, schools, and churches, shall be provided, above the first story, with fireproof shutters, capable of being opened and closed upon the outside. The occupant is required to close the shutters before leaving the premises at night.

We welcome all enactments like the foregoing, which make it inconvenient and vexatious for people to own or build inflammable structures. The tendency of such laws is to hasten the good time when nothing but fireproof materials will be permitted in the erection of buildings. This is the only sure and practical method of averting the dangers of general conflagrations, to which all of our towns and cities are now constantly exposed. We are confident that, if laws were passed to encourage the erection of dwellings and other buildings wholly fireproof, our architects and builders would soon invent the methods and means of accomplishing the work at costs not greatly exceeding those of the structures now commonly put up, in which wood is so largely a component.

Until a clean sweep out is made of everything of a combustible nature in our building materials, we must submit to be saddled with the expenses and annoyances of special laws, fire insurances, fire brigades, police, private watchmen, steam and hand engines, water tanks, chemical extinguishers, fire escape apparatus, and other paraphernalia.

The losses by fire in New York city in 1873 are put down at $2,650,000. The expenses for running the fire department of the city during the same period amounted to over $1,500,000, requiring the employment of 600 men and 150 horses, 40 steam engines, 18 hook and ladder machines, and 4 chemical engines. In addition to the foregoing, the indirect losses and expenditures due to the use of combustible building materials in New York city may be safely estimated at $2,000,000 per annum, making a grand annual total of $6,000,000.

SCIENCE READS AN ORACLE RELATING TO THE METALLURGY OF THE FUTURE.

One of the most interesting incidents of the visit of the American Society of Civil Engineers to the Stevens Institute of Technology, at Hoboken, suggested the above title for our article. After witnessing the beautiful experiments exhibited by President Morton, inspecting the multitude of interesting objects in the lecture room of the Department of Engineering, and spending a pleasant quarter of an hour with Dr. Mayer among the mysterious physical apparatus of his laboratory, the party crowded into the little lecture room of Professor Leeds. The professor had thrown upon the screen the images of several contorted and rather uninteresting looking specimens of mineral. These, he states, were pieces of a "fulgurite," or thunderbolt, as it is often called, sent him from North Carolina. When a heavy flash of lightning strikes the earth, it sometimes fuses the soil in its track, and, on solidification, it becomes a solid bar or rod, which may be, and often is, dug out of its bed. In this case, the lightning had penetrated a bed of pure white sand, melting the silex and forming a hollow shaft two or three inches in diameter and four feet long, filled within and surrounded without by the white sand of the locality. The shaft, however, was not white. Its color varied from a dark to a light pearly gray. Chemical analysis showed it to contain iron, and so accurate was the work that, on estimating it as usual, as oxide, the figures proved some error to have occurred. Estimating it as metallic iron, the figures were correct. Apparently, therefore, the fulgurite was discolored by finely divided metallic iron, and this deduction was confirmed by other and direct experiment. This would explain the peculiarity of color, since the oxide would have colored the silex green. But metallic iron does not exist in Nature on the earth's surface, and the chemist was compelled to seek some explanation of its existence here by an examination of the peculiar conditions under which it was produced.

The final conclusion seemed necessarily to be that, at the immensely high temperature at which silica melts (the extreme limit attainable with the oxyhydrogen blowpipe), iron "dissociates" from oxygen, and that here, dissociation having occurred, the metallic iron, transported by the electric flash from some subterranean deposit, became encased in molten sand, and was preserved unoxidized within the fulgurite. The melting of that immensely refractory material, silex, the dissociation of iron from oxygen, and the transportation of such an amount by electrical action, were circumstances at once remarkable and interesting. After describing this interesting research, Professor Leeds called upon his colleague, Professor Thurston, whose frequent contributions to the SCIENTIFIC AMERICAN have made his name familiar to our readers; and that gentleman then gave his fellow members of the society and of his profession an outline of the possible bearing of this curious instance of natural metallurgy upon the future of the art. He stated that, while it could hardly yet be considered as probable, it certainly did not appear impossible that at some future time the processes of art might imitate what was here seen accomplished by Nature, and that this interesting phenomenon might be a strong intimation of the direction in which metallurgical changes might lead. Could a material be obtained of which to build furnaces which should be capable of resisting the temperature at which silex melts, and could such a temperature be attained in the furnace, we need but throw our ore upon the bed of the furnace and allow it to reach the temperature of dissociation, when the oxygen would pass off up the chimney, without the use of carbon or other deoxidizing agent, and the metal would flow down upon the hearth. The requirement of a new refractory material may not improbably be fulfilled. Equally remarkable discoveries are frequently made. The attainment of so high a temperature necessitates probably the invention of a method of preventing the dissociation of oxygen and hydrogen by high temperature. As we also have stated, in an editorial article in our last issue, the limit of combination of these gases, or their temperature of dissociation, is stated by Deville at about 4,500° Fah., and this is, therefore, the limit of temperature attainable by their combustion. Oxygen and carbon dissociate at a lower temperature.

The speaker referred to the possibility that this elevation of the limit may be attainable by carrying on combustion under pressure, as already proposed by Bessemer, and as probably illustrated in some slight degree by the elevation of pressure within the converter, and the extraordinary temperatures there observed. This interesting subject and the novel ideas suggested by it were evidently looked upon as important as well as entertaining by the visitors, one of whom expressed the idea which is embodied in the title which we have assumed for our article, and nearly all of whom forgot professional dignity so far as to applaud heartily. Many of our readers, by the character of their pursuits, are also interested in this subject. We hope that some may be so fortunate as to be able to aid in securing the benefit here indicated as possibly attainable.

THE ASTOR LIBRARY.

By the munificent endowment of the late John Jacob Astor and of his son William B. Astor, the splendid institution known as the Astor Library was founded in this city. Its doors are open free of charge to all comers, and here the reader may call for any books on the catalogue and spend as long a time in their study in the alcoves of the library as he desires. There are 147,640 books and pamphlets now upon the shelves, which, with the building, have cost something over $700,000. The twenty-fifth annual report shows that during the past year 116,694 volumes were given out to readers, of which about one half were books relating to the department of Science and Art; and of the twenty divisions of this department, by far the largest number of books called for by alcove readers were those relating to patents. This is an instructive fact, showing the useful influence of our patent laws in leading people to study up the recorded knowledge of subjects which have specially engaged their minds.

PHILOSOPHERS ON SOUND.

The phenomena of sound and light are, as every student knows, closely analogous.

In media of uniform density, luminous impulses travel in straight lines. In media of various or varying density, the lines are broken or curved. A rod wholly in water or wholly in air appears straight; if partly immersed, it seems to be broken at the surface of the water. The rays of the rising and setting sun come to us through miles of atmosphere increasing in density, and are so curved in their passage that we see the sun when it is really below the horizon.

As sonorous impulses are refracted according to substantially the same laws, similar acoustic phenomena must occur under corresponding conditions: in other words, sound waves passing through atmospheric strata or other media of different densities will be bent from a straight course, rising or falling, or swerving to right or left, as the conditions may determine.

These are elementary principles, taught and illustrated in every textbook of physics, though the phenomena are less studied in the case of sounds than in the sister department of optics. It happens, too, in our ordinary thinking, that we seldom take them into account, probably because the sounds we have to do with rarely come to us through media greatly varying in density; or if they do, the precise direction of the sounding body is seldom a matter of serious importance. The ear measures angles very rudely, and usually a rough approximation to a correct estimate of the course of a sound wave is quite sufficient for our needs.

This fact is of little moment in itself; but in view of the conflict of opinion between Professor Tyndall and Professor Osborne Reynolds, as to the proper explanation of the irregularities observed in the transmission of sounds under varying conditions of the atmosphere, it rises to some degree of dignity. At least it serves as a striking illustration of the tendency of philosophers to overlook simple and familiar laws in seeking the causes of unfamiliar phenomena.

The reader will remember that Professor Tyndall lately investigated the variable sonorous power of fog horns, whistles, artillery, and other sound producers, and arrived at the conclusion that the unequal range of the sound of a given instrument on different occasions must be owing to the greater or less "acoustic transparency" of the atmosphere, due to the presence or absence of streaks of vapor or unequally rarefied air. At night and during cloudy, rainy, or foggy days, the atmosphere is to a great degree homogeneous; consequently, sound travels freely and reaches its maximum distance. On the contrary, on clear days the sun rays produce unequal effects on different substances, giving rise to columns of vapor or heated air, and the sound is quenched, Professor Tyndall asserts, by reflections and partial echoes from their surfaces.

The theory is a pretty one, but unfortunately it does not tally with fact. The sound waves, which Professor Tyndall assumed to be quenched, are shown by the observations of Professor Osborne Reynolds to have been simply deflected upward and carried over the listener's head. Thus, in one instance the sound of a bell, which was inaudible thirty yards distant on the ground, could be plainly heard at seventy yards when the observer stood up. At one hundred and sixty yards, the deflection was so great that the bell could not be heard at an elevation of thirty feet, though it was distinctly audible a few feet higher.

Professor Tyndall's columnar reflectors would therefore seem to be only figuratively "in the air." Such things might cause the stoppage of sounds, but the evidence is rather that they do not; and Professor Tyndall is fairly convicted of unscientific haste in coming to his very decided conclusions.

On the other hand, Professor Reynolds appears to have overlooked the familiar laws of refraction. According to his mode of accounting for the facts, the lifting of sound is due to the increasing velocity of air currents as the elevation increases, and is in direct proportion to the upward diminution of the temperature. The reasoning by which this position is supported, however, seems to be rather the consequence than the antecedent of the conclusion. Undoubtedly both wind and temperature are modifying elements, Professor Tyndall's reflecting columns sometimes entering the problem in like manner; still the effects of these conditions are accidental, and probably small in comparison with the refracting influence of atmospheric columns of varying density, and more especially the diminishing density of the atmosphere upward. One of Professor Reynolds' observations suggests a course of experiment which students may find attractive. We quote his fifth general conclusion:

"In all cases where the sound was lifted, there was evidence of diverging rays. Thus, although on one occasion the full intensity was lost when standing up at 40 yards, the sound could be faintly and discontinuously heard up to 70 yards. And on raising the head, sound did not at once strike the ear with its full intensity nor yet increase quite gradually, but by a series of stops and fluctuations in which the different notes of sound were variously represented, showing that the diverging sound proceeds in rays separated by rays of interference."

Trusting to Professor Tyndall's somewhat "treacherous imagination," we should interpret the facts very differently, accounting for the observed fluctuations by difference of refrangibility between high notes and low notes rather than by "interference," the conditions of which do not seem to be present. As a matter of prudence, however, we prefer merely to suggest that the matter be tested by experiment.

Recurring to the analogy of light, and remembering that the refrangibility of light rays increases with their rate of motion—red rays, for example, being less refracted than the more rapid green and blue rays—and bearing in mind the fact that sound notes differ, as colors do, simply in speed of vibration, we should naturally expect a corresponding difference in their refrangibility, producing under suitable conditions the effects observed by Professor Reynolds. It would be an easy matter to test this conclusion by means of a prism of gas, after the fashion of the gaseous lenses sometimes used in acoustic experiments. The analysis of sounds is no new thing; but its prismatic analysis has not, to our knowledge, been attempted. The experiment would therefore be novel, and, we think, sufficiently interesting to repay the trouble involved.

QUICKSILVER has been discovered in the mountains back of Boralitos, Santa Cruz county, Cal. Claims have been located and a company has been formed to work one of them.

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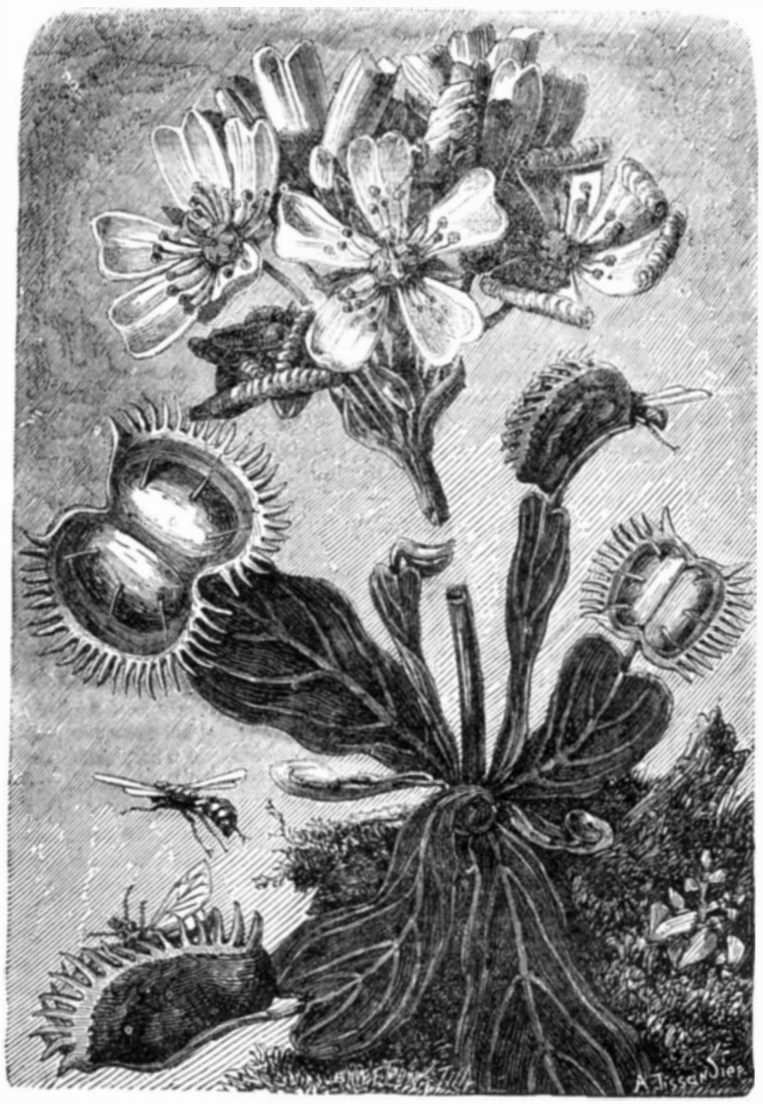
ELECTRIC PHENOMENA OF THE LEAVES OF THE FLY CATCHER.

The *dionœa muscipula* or fly catcher is one of the most curious examples known of a vegetable gifted with motion. The leaves of this plant, which are shown in the annexed engraving, for which we are indebted to *La Nature*, are terminated by a limb which carries two concave plates or valves united by a kind of hinge. If an imprudent fly venture to rest upon the inner surface of this trap, the plates, the minute bristles upon which become irritated by the presence of a foreign body, suddenly snap together like the covers of a book quickly closed. If the insect struggles, the portions adhere more closely, holding him prisoner until he dies or until, tired out, he remains motionless. Then the plates slowly open, ready to close again, however, on the least movement of the fly. If this does not take place, the trap allows its victim to fall out and remains set for new prey.

Professor Burdon Sanderson, of the Royal Society, has recently made some interesting investigations into the electric condition of this singular plant, proving that its movements are due almost entirely to electrical circumstances. By connecting sometimes the limb and sometimes the petiole of a living leaf with the circuit of a galvanometer, two permanent currents have been discovered, acting in contrary directions, one passing through the limb from base to apex, and the other directed from the base of the limb to the base of the petiole. The experiments of Professor Sanderson throw considerable light on phenomena heretofore very obscure. The peculiar movements of vegetables, it may be considered as established, result from changes in tension produced in the tissues, either spontaneously or accidentally. The tensions are due to the unequal turgescence of the cellules, the surfaces of which either absorb the water which surrounds them or else abandon it, by virtue of a special property of their substance under the influence of physical forces, such as light, heat, and without doubt electricity. The most recent researches, for example, show that the drooping and the erection of the leaves of the sensitive plant result from a displacement of the water which swells alternately the superior and inferior vessels of the base of the petioles.



THE FLY-CATCHING PLANT.

The Samuel Owen Centenary.

The hundredth anniversary of the birthday of Samuel Owen, May 13 last, was made the occasion of a public celebration in Stockholm. To Owen is due the credit of first instructing the Swedes in the use of their native iron, and he is now termed the father of Swedish steam navigation.

Leaving England with but one hundred pounds sterling, Owen established a manufactory at Kungsholmen and devoted himself to teaching his workmen not only to improve their labor but their lives. Hearing of Fulton's successes with steam navigation in America, he began researches into the same subject, which, it is said, led him in 1815 to the discovery of the screw propeller. He did not, however, prosecute his experiments in that direction, having neither time nor money, but continued labor in his factory, from which, up to 1843, when the works were closed, thirty steamboats, two of which were of iron, were produced. He died on February 15, 1854.

Professor Edlund, of the Stockholm Academy of Sciences, read an account of his life and services and pronounced a fitting eulogy, and subsequently a monument, bearing a fine bust of Owen, erected by the ironmasters of Sweden, was unveiled.

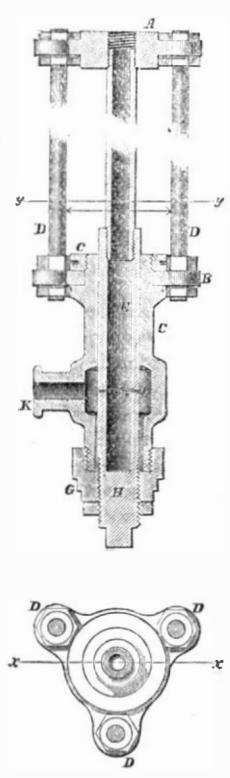
The Fort St. Philip Canal.

A bill has lately passed the House of Representatives which provides for a canal two hundred feet deep at the bottom, and twenty-five feet deep, to form a permanent highway from the Mississippi river to the Gulf of Mexico. The work is to be constructed by the United States, to be free to all nations, to be completed within three years, and to cost not more than eight millions of dollars.

For many years past, all the efforts which have been made to keep open the channels through which the great river empties into the Gulf have been attended with failure. As far back as 1837, extensive dredging was attempted but abandoned as unavailing, and in 1852 jetties were put down at the mouth of Southwest Pass, and another trial of deepening made, the results of which work, however, completely disappeared within the four years subsequent. Latterly steam dredging boats have been employed, rendering the river mouths practicable at times for large vessels, but not effecting the opening of the permanent channels for which the large commerce of New Orleans is now suffering. The present proposed canal, which is to extend a distance of six and a half miles, from the left bank of the Mississippi below Fort St. Philip to a point four miles south of Breton Island, was projected by Benjamin Buisson some forty years ago. The plan was favorably regarded by Congress and several surveys were made of the route, up to the beginning of the war, which put a stop to further proceedings. At the present time, the urgent necessity for the work has been brought to the notice of Congress, and it seems probable that it will before long be begun. The canal will form an outlet for the great region drained by the Mississippi, covering some 750,000 square miles and producing yearly a billion of bushels of cereals; and its construction will tend greatly to the speedy development of the commerce of New Orleans and the adjoining country.

BONSER'S PATENT STEAM TRAP.

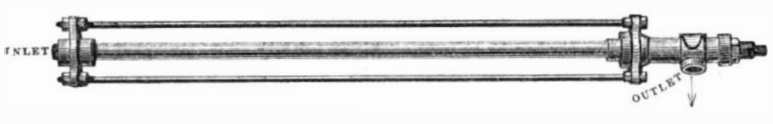
Absence of floats, disks, and levers, thus avoiding lost motion, a positive operation, simplicity, and durability, are the advantages claimed for the improved steam trap represented in vertical section, horizontal section, and in perspective, in the annexed engravings.



At the top of the instrument is a triangular head, A, and a similar triangular plate, B, is screwed to the cylinder, C, by the nut, *c*. These plates are held together by means of three rods, D, which are provided with screw nuts. Within the cylinder, C, is a tube, E, to which is attached a second tube, F, screwed in the triangular head. These tubes are of copper or other suitable metal. H is a tubular spindle, held in cylinder, C, by the thimble nut, G, and its upper end with the lower extremity of tube, E, both being flat square surfaces, form a joint, J, surrounded by the chamber, I, which chamber is in communication with the outlet pipe, K.

The water of condensation enters tubes, E and F, and is discharged between the ends of tube and spindle and thence out of the pipe, K. Steam then enters and takes the place of the water, when the tubes, E and F, will expand downward in length from the head piece, A, sufficiently to close the aperture in joint. J. When water again accumulates and becomes cold, the tubes (or one of them) contract and a discharge once more takes place, and so on indefinitely.

The thimble nut, G, allows the tubular spindle, H, to be adjusted with great nicety, so that the joint, J, will close when the tube contains steam and open when it contains water or when the temperature falls.



It will be seen that the instrument, when properly adjusted, is governed by the degree of temperature. Its operation will be the same if steam enters only tube, F.

For further particulars address the inventor, Mr. S. Bonser, Dover, N. H. The patent is offered for sale on reasonable terms.

The King of Siam's Dinner Service.

A superb service of silver plate, of the total value of $50,000, and weighing 15,000 ounces, has just been manufactured by the eminent firm of Messrs. Elkington & Co., Birmingham, England, and which exemplifies, in a high degree, the great perfection in taste, design, and workmanship to which the art of the silversmith is carried. It is a state dinner service, made to order for the King of Siam, and is, in every respect, well fitted to grace a royal table. It is, of course, solid silver throughout, and consists of a large number of pieces, being intended to dine about sixty persons in state. Conspicuous among the others is the principal centerpiece, a splendid and massive piece of workmanship. It is nearly four feet high, and the design is that of a three-headed elephant—a symbol of the Siamese religion—standing upon a plateau, and bearing on its back a castle, above which is a double vase with a tower-shaped stem. The trappings of the elephant are of delicate gold work, and gold tassels depend from the ears. Though the idea of gracefulness, in conjunction with a three headed monster, might seem rather difficult to conceive, the heads are so arranged as to detract in no degree from the appearance of the figure. Standing in front, just under the heads, are two keepers in martial attire, each with a long staff, from the top of which projects the national flag of Siam. This piece, which weighs 700 ounces, bears in three places the coat of arms of the King, in high relief and richly molded and chased. There are fourteen other centerpieces of smaller size, but all of the same design as the principal one. Six four light candelabra, of palm tree design, with a three-headed elephant standing under each, will help to illumine the royal banquet whenever the service is used; and among the other pieces which compose the set are six wine coolers, six large hot water dishes and covers, six rice dishes, six oval *entrée* dishes, twelve bread baskets, eight sauce tureens, six cruet frames, four large oval trays 28 inches long, and four salvers of smaller size, and about 150 dozen of spoons and forks.

The design is Oriental, and an elephant with one head forms the handle of each of the dish, tureen, and other covers. Every piece has also carved upon it the King's coat of arms and his name in a monogram.—*Ironmonger.*

Hydrophobia.

The Board of Health of this city, referring to an ordnance requiring dogs to be muzzled during the hot months, state that hydrophobia is imparted only by inoculation and that a rabid animal may give the disease through a metallic muzzle as easily as if the obstruction did not exist. Hydrophobia occurs in the coldest as well as in the hottest weather, and with perhaps greatest frequency during the spring months. Male dogs are more apt to be affected than females, and the condition of the animal, whether household pet or vagrant, has no influence on the taking of the malady. Owing to a portion of the deadly saliva being retained by the clothes of the person bitten, it is found that only five to twenty per cent of those thus injured become inoculated. An eminent veterinary surgeon, of this city, gives the following symptoms by which the approach of rabies in the dog may be recognized. When the period of inoculation is passed (three to seven weeks), the animal becomes restless and watchful. It shuns the light and its bark changes to a kind of a howl. The skin shrinks and tightens, the head is depressed, and mucus appears at the mouth and nostrils. Nervous symptoms are very prominent, and the whole aspect of the animal denotes an unusual condition. Dogs or cats thus suffering should be immediately destroyed.

In the wholesale crusade against the dogs which has just begun in this city, carbonic acid gas is for the first time used as a means of destruction. The old plan was to place the unclaimed animals in a huge vat and pump in water until they were drowned. The present idea is a large chamber, into which forty curs at once are placed, and there kept until a plentiful supply of the deadly gas ensures their death.

Evaporation instead of Ice.

Ice threatens to be an expensive luxury this summer, and many persons will doubtless be obliged to dispense with its use. In the country, where water may be drawn cold from the well or the spring, and a clean cool cellar or dairy preserves the food fresh, it is not so much missed, but even there water and butter cannot remain many minutes, in the temperature of the eating room, without losing their agreeable qualities. Several thicknesses of wet cloths, wrapped about the pitcher, will, by evaporation, keep the water tolerable. A common flower pot, inverted over a plate of butter, and kept covered in the same way, with wet cloths, will keep butter in that state of solidity which is essential to its attractiveness.

If proper provision is made for expansion, portable engines can be made quite as durable as stationary engines.

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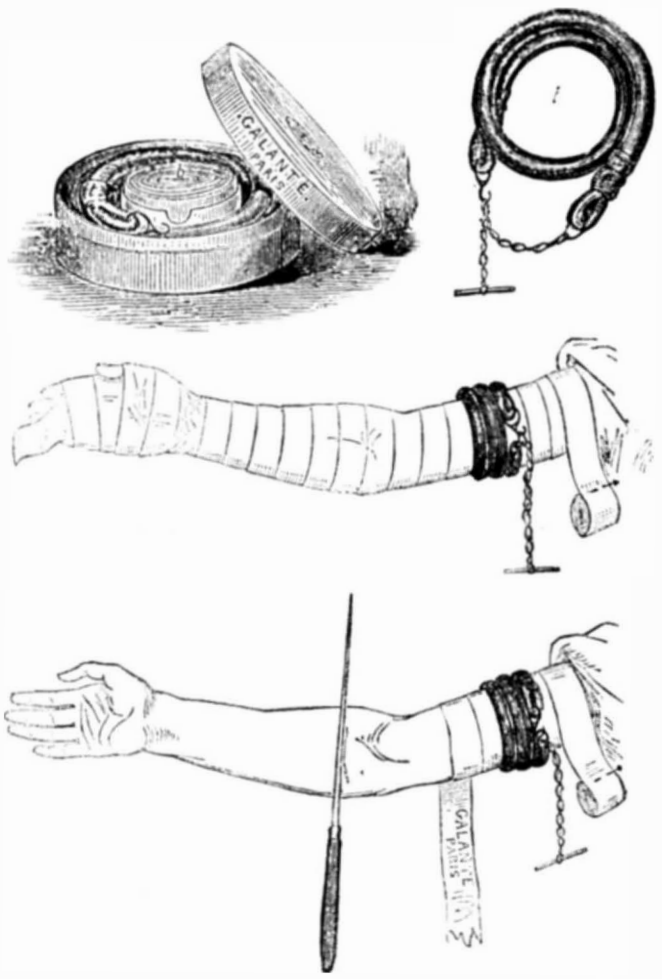
BLOODLESS SURGERY.

We have already briefly alluded to the Esmarch process for performing surgical operations without provoking the usual hæmorrhage. The annexed engraving, extracted from *Les Mondes*, represents the devices used in connection therewith by the inventor. These consist in an elastic bandage, measuring 26 feet in length by 18 inches in breadth, and a tube or cone of strong vulcanized rubber, having a hook at one end and a chain and bar at the other.



The application of the apparatus is very simple. Supposing that an arm is to be amputated, the bandage is tightly wound around the member from the extremities of the fingers up to a little above the point at which the division is to be made. By this uniform compression, the blood is forced back and out of the vessels. At the upper limit of the bandage, the rubber end is passed three or four times around the arm as closely as possible, and fastened in place by the hook and chain, thus preventing the return of the circulation to the member after the bandage is unwound. The latter, on being removed, leaves the arm white and free from blood and hence ready for the operation, which is accomplished with a very trivial effusion.

A Specimen Book Catalogue.

Mr. E. Steiger, of 22 Frankfort street, New York city, has circulated a specimen of a proposed catalogue of the whole American literature, and desires the opinion of the press on the system. A work, similar in its object but far less complete in its details and not so well arranged, is used in England, and is found especially valuable to librarians and readers as well as to the publishing trade. When we state that the specimen pages now before us give the titles of books and names of authors in full, the dates of the editions, number of pages, size, binding, price, and publisher's name of each volume, our readers will understand the thoroughness of the scheme, and will believe the author when he says that the undertaking is not remunerative.

A Public Benefactor.

The splendid charities of Peter Cooper and George Peabody have been overshadowed in extent, though not in spirit, by the extraordinary munificence of Mr. James Lick, of San Francisco. This gentleman, the possessor of enormous wealth, has recently, in a single instrument, deeded away the sum of two million dollars for the establishment of institutions for the public benefit, preferring to superintend the disposition of his fortune and enjoy the fruits of his beneficence during his lifetime, rather than to follow the usual course of bestowing his bounty by will. The deed, which is a lengthy document, containing some eighteen articles, is dated the 2d of June, 1874, and conveys to seven trustees, for a nominal consideration, an immense amount of property, which they are instructed to sell. Out of the sum obtained, $700,000 is set aside for the placing on land, on the borders of Lake Tahoe, Placer county, Cal., "a telescope superior to and more powerful than any telescope ever yet made, with all the machinery appertaining thereto." If the above site is found to be unsuitable, provision is made for the selection of a more appropriate locality. The announcement of Mr. Lick's intention thus to provide for the "million dollar telescope" appeared in our columns, it will be remembered, some months ago, and with the delivery of the present deed, the practical establishment of the great observatory—the greatest the world has ever seen—begins.

After this donation, which commences the series, follow gifts of $25,000 in gold to the Protestant Orphan Asylum of San Francisco; $25,000 to a similar institution of San José Cal.; a like sum to the Ladies' Protection and Relief Society of San Francisco; $10,000 to the Mechanics' Library Association, $10,000 to the Society for the Prevention of Cruelty to Animals, both of same city; $5,000 for a monument for the donor's mother, and a like amount for memorials of two other relatives; $100,000 for an Old Ladies' Home; $150,000 for public baths, $150,000 for a statue of Francis Scott Key, author of the song of the "Star Spangled Banner"; and $250,000 for a statue illustrating the progress of the State of California in education, mechanical arts, and mining, for designs for which sums of $10,000 and $5,000 are offered. $300,000 is devoted to the foundation of the "California School of Mechanical Arts," for the education of both sexes "in the practical arts of life, and in whatever industry to which mechanical skill now is or can hereafter be applied."

The residue of the proceeds is divided between the California Academy of Sciences and the Society of California Pioneers, to be expended for buildings, library, apparatus, etc. The donor provides for all his living relatives and reserves a handsome income for himself

Mr. Lick is the son of a farmer and was born in the town of Lebanon, Pa. His early life was spent working on the farm. While quite a young man, he went to South America and there became a large cattle raiser, supplying horses to the Governments of Brazil and Buenos Ayres. At the breaking out of the gold excitement in California in 1849, Mr. Lick was in business in Valparaiso; but turning over his affairs to a friend, he took $20,000 in doubloons and started for the new country. With great sagacity he immediately invested his funds in real estate in San Francisco, holding fast to his bargains, and building slowly and carefully. The rapid rise in value of his property resulted in immense profits, out of which he erected the Lick House in San Francisco, one of the finest hotels in the world. It is a portion of the colossal fortune, thus made, which Mr. Lick has devoted to the uses above detailed, thus placing himself in the front rank of philanthropists.

A Lecture Experiment with Potassium.

To show the green color of gaseous potassium, it is volatilized in wide horizontal tubes through which hydrogen passes, which becomes spontaneously inflammable, and burns with a brilliant violet flame, while the hot part of the tube becomes filled with green vapor, condensing in the colder parts as a mirror. When the experiment is finished and air gradually admitted, the potassium is first oxidised to the blue quadrant-oxide.

FEATHERING ARROW HEADS.

Our engraving shows an arrow head from the collection of L. G. Olmstead, LL D., of Fort Edward, N. Y., found near Peoria, Ill. It is believed to be unique, not existing in any other collection in this country or Europe. Its peculiarity

consists in the beveled edges, as shown in our illustration, which give rotation to the arrow when it flies through the air, thus improving the accuracy of the missile. This is believed to be the earliest example of the feathering projcetile extant.

Correspondence.

Explosion of the Fireless Locomotive.

To the Editor of the Scientific American:

The New York and Brooklyn papers recently gave the history of the Thermo-Specific Motor Company's new engine, which has just been built at the Grant Locomotive Works at Paterson, N. J. This engine was brought to the South Ferry, Brooklyn, and thence taken to East New York. On May 22 a large party of editors and reporters were invited to attend the trial trip. The engine was filled with boiling water within 9 inches of the top, and steam was raised to a heat of 380° Fah., with the following results:

"An explosion, which might have resulted disastrously, occurred yesterday afternoon at East New York. One of the new engines which it is proposed to introduce on Atlantic avenue was hauled out for inspection and testing. The engines are built on a novel principle, having no generating boiler, but taking steam from a "service tank" at the end of the road. The engine drew up to the tank, and was in course of obtaining its supply of steam, when an explosion occurred which threw the tank nearly a hundred yards up the track, the lid being blown about fifty feet further and broken to pieces.

Several of the bystanders had very narrow escapes, but, fortunately, nobody was injured; everybody was badly scared, and the excitement in the village was intense for some time."

None of the reporters present published an account in any paper. This account was obtained by a reporter of *The Argus* meeting a person who saw the explosion. The *débris* was immediately cleaned off, as I am informed, and a visit to the officers of the company gave the reporter no farther information. I have not as yet heard of any investigation. Is it possible that the press can be so quieted, and that a new steam boiler, with steam at 380° pounds pressure,* can explode the first time it is used, and no investigations be made? If I recollect rightly, your paper, in about March or April, 1873, published a full account of the thermo-specific that was to supersede horses on the street cars. I hope the opportunity will not be lost, and that a full and impartial investigation will be made.

EDWIN BAKER.

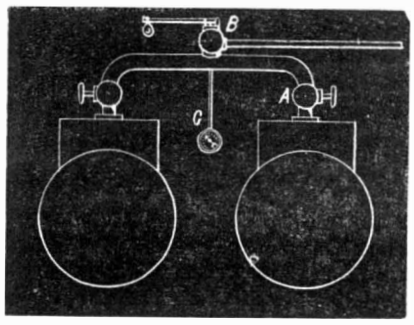
240 Atlantic avenue, Brooklyn.

Boiler Explosion near Geddes, N. Y.

To the Editor of the Scientific American:

A disastrous boiler explosion occurred this morning at Ashton Mills, Geddes, N. Y., killing two men outright, and two more are not expected to live. How many more are injured I have, as yet, been unable to ascertain. Some men here are making or attempting to make a mystery of the affair; others are trying to find fault with the boiler, the engineer making the statement usual in such cases, namely, plenty of water, not much steam, explosion incomprehensible, etc.

The cause will be obvious to you, in view of the idiotic manner in which the connections between the exploded boiler and its mate were made, which the engraving will explain. A is the globe valve, of which there was one to each boiler, B the safety valve, and C the pressure gage.



The boilers were both run together by day, and only one at night, the latter being shut off by its globe valve, A, which, it will be seen, shut it off both from the safety valve, B, and the steam gage, C, it being left to the night watchman to open it and fire up the boiler in the morning. Neglect to open that valve is the unmistakable cause of the disaster, as it is of many others which have happened to boilers so connected. That it could have been no fault of the boiler is certain, as it is not broken in any place by the steam. But the heads are forced out, by a gradually increasing pressure, until the sheet left the tubes, when the reaction of issuing steam caused the boiler to fly end over end, doing great damage. In my opinion the excellence of the boiler is manifest by its condition.

OPERA MUNDI.

Syracuse, N. Y.

Bullets Impacted in the Air.

To the Editor of the Scientific American:

Having seen a statement in one of your city papers that a wonderful curiosity, in the shape of a rebel and a Union bul-

let impacted in the air, was soon to be placed in the Museum of the Ordnance Department, at Washington, I inclose you a bullet which I found on the rebel earthworks in front of Petersburgh, on the sabbath after the surrender of that city.

H. ANDERSON.

Peekskill, N. Y.

CHROMIC ACID SOLUTION FOR BATTERIES.—An improved cirepe, by which a stronger current is produced, is as follow: 12 parts by weight potassium bichromate in 150 parts water, with addition of 25 parts of sulphuric hydrate.

*Our correspondent considers a steam of 380° Fah., as previously mentioned which would be about 160 pounds pressure.—EDS.

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A NOVEL MECHANICAL MOVEMENT.

Mr. Bernard Frese, of Gilman, Ill., has patented, January 6, 1874, an ingenious device for converting rotary into rectilinear reciprocating motion, or *vice versâ*. Its object is to transmit an even and uniform power to a wheel, for example, and, when used in connection with a single cylinder engine, it obviates the possibility of a dead center. It is hardly necessary to point out the many applications of which the invention is susceptible, as these will be readily apparent from the following description of its operation:

Our engravings show the apparatus in two views, the first of which, Fig. 1, may be termed the working side, and the second, Fig. 2, the governing side. A is a frame upon guides in which travels the reciprocating head, B, to which is attached a rod, C, passing through one end of the frame. Journaled in the central portion of the latter, and passing through the long slot shown in the head, is a shaft which, at

Fig. 1

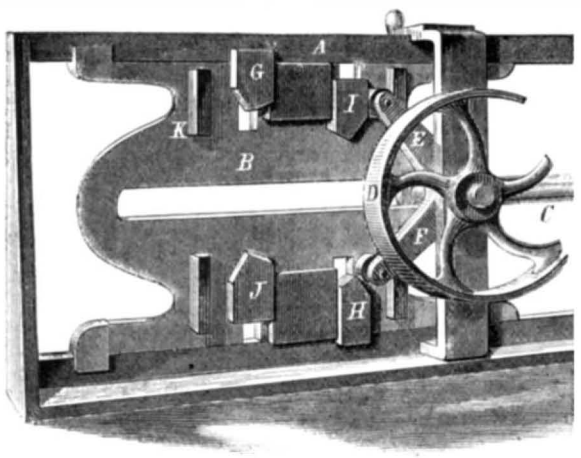
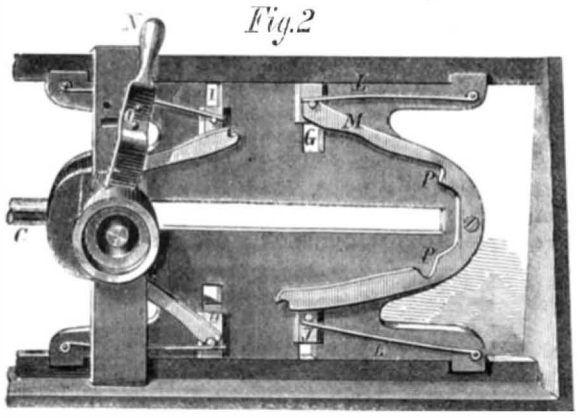


Fig. 2



one extremity, carries the belt wheel, D. At the same end of the shaft, but on the other side of the journal, are two arms, E F, at right angles to each other, formed from a single piece and rigidly attached, at their angle, to the shaft. The head, B, has on its edges four slots, which serve as guides for four small movable plates or blocks, G, H, I, and J. Adjoining these last are four fixed studs, K, firmly secured to the head. The rear sides of the blocks are shown correspondingly lettered in Fig 2, and upon each is a pin, against which springs, L, act so as to hold the blocks against the inner ends of their slots.

Pivoted at each end of the head are V-shaped pieces, M, in each arm of which is a notch, which, when engaged with the pins on the back of the blocks, tend to hold the latter to the outer portions of their slots, or, in other words, to act against the springs, L. It will be observed that, in our engravings, the blocks, G and H, are thus immovably held, while the blocks, I and J, are free to travel forward and back in their slots, pushing, of course, in one direction against their springs.

We can now follow the operation of the device under the conditions represented. The head, being at the extremity of its stroke to the left, begins its motion to the right. The arm, E, of the pair secured to the shaft, is first struck by the block, I, which impinges against a friction roller on the end of the same. The block, traveling to the right, carries the arm with it, so turning the latter into a lever to rotate the shaft. The arm, F, being unobstructed, for the corresponding block, H, is held back out of the way, is necessarily carried upward, so that the two arms, being placed at the proper distance apart, arm, F, after the head has traveled half its stroke, enters between the block, G, and the stud on the left of the same, and takes against said stud. We have now the arm, E, between the block, I, and its stud, and the arm, F, between the block, G, and its corresponding portion. This arm, F, is next acted upon, and being caused to turn to the right, by the pushing against it of the stud, rotates the shaft, and in so doing brings the arm, E, so that its extremity takes against the right hand inclined edge of the block, J. The latter is, however, merely held forward by its spring, so that it readily yields to the pressure of the arm, which slips behind it. The head is now at the end of its stroke, the ends of the arms are once more in a vertical line, and the shaft has made half a revolution. The return movement being begun, the same operation is repeated. The arm, F, travels over from the outside of block, G, to the inside of block, H, and the arm, E, over against the block, I, which, in turn, yields, so that at the conclusion of the stroke the various portions are once more as represented in the engraving.

In order to reverse the movement or cause it to stop, the lever, N, Fig. 2, working loose on the shaft, engages with a projection, O, which passes through a curved slot in the frame. This projection is formed upon a bar, not shown, which also works upon the shaft. At either side of the latter and formed on the under portion of the bar, are two projections which, by turning the lever so as to throw either end of the bar at an angle to the vertical, may be placed one in advance of the other in respect to either end of the head. Near the curved portions of the V-shaped bars, M, are notches, P, into which the lugs on the governing bar may enter. As placed in Fig. 2, it is clear that the upper lug on the bar is thrown in advance or to the right, and the lower one to the left. Now suppose the lever to be thrown over the other way, and the stroke of the head to begin. The lower lug is now in advance, to the right. Consequently, as the head finishes its stroke, the lower lug will strike the lower side of the forward bar, M, enter the notch, and, by tilting the V downward, disengage the hook in the upper bar from the pin on the upper block, causing the latter to be thrown inward by its spring, while, at the same time, causing the hook on the lower bar to catch the pin on the lower block, holding the latter immovably, as we have already explained. The return stroke does the same with regard to the other V bar and the other pair of blocks, so that the result is that, instead of blocks, G and H, being held, as in Fig. 1, they are left free, and I and J fastened. A little consideration will show that the result, on moving the head, will be a reverse motion of the arms to that already described. If now the lever, N, be placed exactly in the center, the effect is to throw all the hooks of the V bars off the pins on the block, and the arms, pressing equally on both blocks nearest them, are unable to move in either way, and thus the motion is arrested.

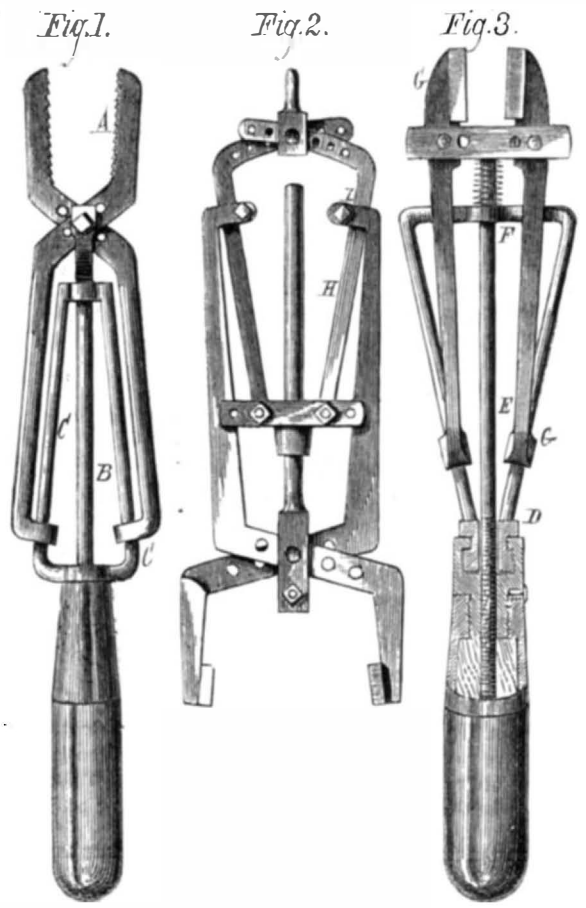
It is claimed that this device will be of considerable utility as applied to hoisting engines, as it allows the motion of the machine to be quickly altered or arrested, while using almost the full power. For further particulars address the inventor, as above.

IMPROVED GRAPPLING TOOLS.

We illustrate herewith three forms of grappling tools patented March 18 and 25, 1873, through the Scientific American Patent Agency, by Mr. Simon B. Dexter, of Mason City, Iowa. In Fig. 1 is shown a device which may be used as a wrench, pincers, or grapple for raising and carrying weights. The jaws, A, by means of a series of holes, are made adjustable to adapt them to articles of different sizes. A shank rod, B, is connected by means of a fork on its end with the fulcrum pin, and extends back into the handle. Upon it is a wedge shaped slide, consisting of two rods, C, which pass through eyes on the pincer handles. When any object is secured between the jaws, it is griped by pulling upon the handle, causing the arms of the pincers to come together, and is loosened by a contrary movement. This feature adapts the tool for grappling for articles under water, as well as for carrying heavy articles in founderies.

Fig. 3 is an improvement on the above mentioned device, in which, by turning the handles, a swivel band, D, is also turned. The shank rod, E, is provided with a screw thread, and passes through the swivel band, so that, by the above mentioned motion, the slide, F, is moved up or down on the

Fig. 1. *Fig. 2.* *Fig. 3.*

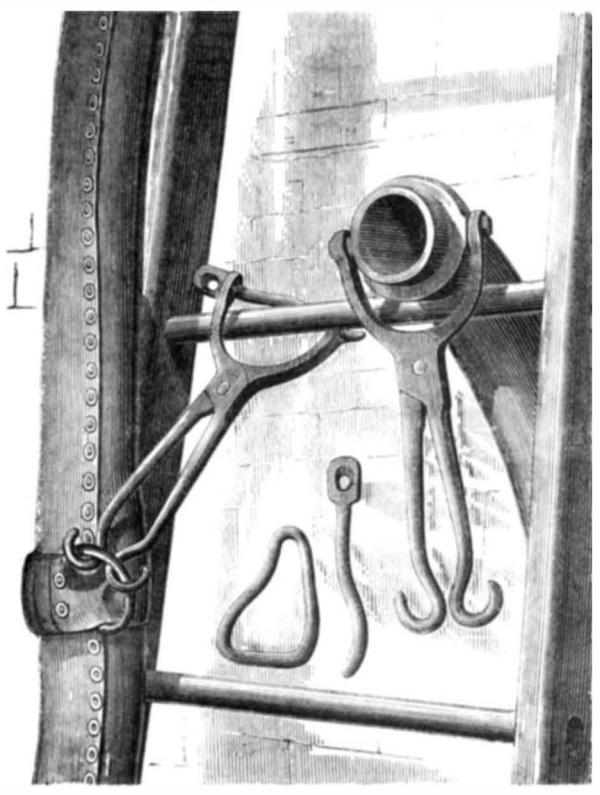


rod. The long ends of levers, G, are thus spread apart or brought together. In this manner the jaws may be adjusted with great nicety and with sufficient power to make the instrument valuable as a hand vise.

The device shown in Fig. 2 is intended for raising or turning stones for buildings, etc., by means of derricks or cranes. It has adaptable jaws, the upper ends of the levers of which are turned towards each other to receive the bars, H, confined in forks therein by rollers, I, and bolts. It will be seen that these bars incline from the vertical guide rod, and together form a wedge-shaped slide for each of the levers. In drawing upwards, the bars bear against the rollers, I, and so close the jaws, and by pushing downwards the reverse takes place.

POND'S PATENT SPANNER.

It is unnecessary for us to dwell upon the importance of any invention which will facilitate the extinguishment of fires. A series of disastrous conflagrations has fully informed the public mind upon this point. Pond's patent spanner, which we illustrate herewith, is an invention of the character referred to. This instrument is, essentially, a pair of tongs, with an eye at the end of each jaw, and a hook at the end of each handle. The advantages claimed over the common spanner are as follows: It cannot be put on wrong; it will turn the coupling either way without being removed; it will not drop off; it can be used in carrying the hose, the point of lifting being at the heaviest portion thereof, namely, at the coupling, instead of one or two feet from the same. The hook handles may be instantly inserted in rings or straps on the hose, which may thus be the more easily dragged or carried. The device also enables the hoseman, by hooking the handles into a ring in his belt, to carry the hose up a ladder or elsewhere while he has both hands free, and also



to fasten the hose to any projecting point or to a ladder. For this latter purpose a pin is furnished, which passes through the eyes at the ends of the jaws of the instrument. One point of excellence which will recommend this spanner to the firemen, especially on cold winter nights, is the fact that by its use hose can be handled without touching the wet exterior with the hands. In short, it is claimed that, by the use of this invention, hose can be handled more easily, quickly, and advantageously than by any other method. Pond's patent spanners are made of malleable steel, finished in best English japan, weighing one pound each, and of sizes to fit different kinds of hose.

Patented in the United States November 25, 1873, and in the Dominion of Canada, May 19, 1874. For further particulars address Lewis Pond, patentee and manufacturer, Foxboro', Mass.

Restoration of Burnt Steel.

J. L. Davies, Landore, near Swansea, Wales, writing to *Iron*, says: "I have found that resin oil, with which is intimately mixed one fourth (more or less) its weight of the residue of paraffin stills, has a wonderful effect upon burnt steel.

"Chisels which have been burnt and rendered useless may be, by means of this fluid, restored and made as valuable as ever. This fluid, which was many months ago christened *restitutor chalybis*, may be used as follows: Burnt steel must be heated red hot, then plunged into the restitutor for a few seconds; then re-heated and cooled in the ordinary way. The steel after this process is perfectly restored.

"Experience in the use of the restitutor will quickly enable persons to give any desired temper to their tools, but it may be stated that tools can be made especially hard by heating them red hot, dipping into the restitutor, then reheating to a slightly white heat, and immediately cooling in pure water."

INCOMBUSTIBLE PAPER AND INK.—An English inventor has secured letters patent for an incombustible and fireproof ink. The pulp for the paper is composed of vegetable fiber, one part; asbestos, two parts; borax, one tenth part; and alum, two tenth parts. The ink can be used either in writing or painting, and is made according to the following recipe: Graphite, finely ground, twenty-two drachms; copal or other resinous gum, twelve grains; sulphate of iron, two drachms: tincture of nut galls, two drachms; and sulphate of indigo, eight drachms. These substances are thoroughly mixed and boiled in water. The graphite can be replaced by an earthy mineral pigment of any desired color.

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THE JUBÆA SPECTABILIS PALM.

This very handsome palm, known also as the coquito palm, of Chili, is the only species of the genus, and is one of the most southern of American palms. It has a stout trunk, swollen in the middle, which, in its native country, sometimes attains a hight of nearly 40 feet. The summit is surmounted by a crown of large, spreading, pinnate leaves, of a full deep green color, and from 6 to 12 feet long, the leaflets being from 1 to 1½ feet long and about an inch wide, springing in pairs from nearly the same spot, and standing out in different directions. The leaf stalks are very thick at the base, where they are inclosed in a dense mass of rough brown fibers, which grow upon their lower edges. In an account of the Royal Gardens, at Lisbon, mention is made of a specimen growing there in the open air, which has attained a hight of 32 feet, and the trunk of which measures 13 feet 8 inches in circumference at its base. "In Chili," says the "Treasury of Botany," "a sweet sirup, called *miel de palm*, or palm honey, is prepared by boiling the sap of this tree to the consistence of treacle, and it forms a considerable article of trade, being much esteemed for domestic use as sugar. The sap is obtained by the very wasteful method of felling the trees and cutting off the crown of leaves, when it immediately begins to flow, and continues to do so for several months, until the tree is exhausted, providing a thin slice is shaved off the top every morning, each tree yielding about 90 gallons. The nuts are used by the Chilian confectioners in the preparation of sweetmeats, and by the boys as marbles."

The soil for this plant, says *The Garden*, from which we extract the engraving, should be a mixture of one half rich loam and one half a compost of peat, leaf mold, and sand. It withstands the winters in the open air near London, in a poor condition; but if grown in tubs in the conservatory in winter, and placed in the open air in summer, it will prove an excellent subject for association with the hardier palms.

THE JUBÆA SPECTABILIS PALM.

Gurjun Oil in Skin Diseases.

At a late meeting of the Medical Society of London, Professor Erasmus Wilson showed some of this new remedy, and stated that this material, which was also called wood oil, was an oleoresin, obtained from several species of the *dipterocarpus*, an immense tree growing on the Malayan coast of the Bay of Bengal, where it was so common as to be used instead of paint, for houses and ships.

In March, 1873, Dr. Dougall, of the Indian Medical Service, took charge of the convict establishment of the Andaman Islands, when he found twenty-four of the prisoners suffering from leprosy. He was deeply impressed with the misery of these poor people; and realizing the impracticability of availing himself of all known methods of treatment, he hit upon the idea of trying the gurjun oil, both as an internal and external remedy, and determined upon giving it a six months' trial. Dr. Dougall's method was to have the patients washed thoroughly in a neighboring stream, using dry earth instead of soap. They were then made to rub themselves for two hours with a liniment composed of gurjun oil and lime water, one part to three, and to swallow two drachms of the balsam, also combined with lime water. After this they had their breakfast, and were set to any work they were capable of doing. In the evening the same process was repeated, except the washing. The effects of this treatment, at the end of six months, were marvelous. Neuralgic pains were allayed, sensibility was restored to the anæsthetic skin, tubercles subsided, and ulcers healed. Dr. Dougall was astonished at the energy of these formerly helpless ones.

Mr. Erasmus Wilson remarked that he had used a liniment composed of equal parts of the gurjun oil and lime water, in cases of painful eczema, in lupus, and in cancer, with very encouraging results, and stated that Mr. Hancock had applied it in a case of cancer of the skin, with the effect of dispersing tubercles and healing ulcerations; but its most useful property was that of relieving pain. A lady in constant pain from cancer of the integument, who had been unable to sleep without narcotics for weeks, was relieved of all suffering, and enabled to sleep, by means of this liniment. Mr. Wilson suggested that this very simple remedy deserved a trial at the hands of the profession, and believed that it would be found a valuable agent of cure in many affections where the skin was painfully attacked.

A Vehicle Dynamometer.

The Royal Agricultural Society of England has recently employed a new instrument for determining the amount of work done in hauling vehicles along a circuitous course, the maximum, minimum, and mean pulls exerted, and the irregularity of strains arising from the varying rigidity of the load. The device is in brief a skeleton horse mounted on wheels and drawn by horses. It is harnessed in the shafts, and the body contains the necessary apparatus. It is believed that the figures obtained will give accurate results regarding the vexed questions of broad and narrow, large and small, wheels, hight of load, weight on horse's back, etc.

From a description of the invention published in the *Engineer*, we learn that it consists of a pair of parabolic steel springs, 4 feet long and connected together by a single joint at one end and a double one at the other. The front blade of these springs is attached at the middle of its length to a horizontal cast iron bed plate which forms a rigid foundation. The back spring plate is attached to a horizontal spindle, supported at its front end in an iron pedestal and at its back end in an oil cylinder. Between the bearing and cylinder, a cast iron swiveling draft plate is loosely jointed to the spindle. This swivel plate is designed to represent the shoulder and collar of a horse, and is fitted with draft chains and hooks, similar to those on collar hames. Beneath the draft plate are castors arranged to run upon the bed plate. The draft plate, with its joints and castors, will transmit the direct, horizontal components only, of the pull on any vehicle, to the main spindle, and will eliminate the transverse components of angular pulls, whether in a vertical or horizontal direction. A lever is jointed to the spindle to multiply any movement of the spindle three times on the horizontal counter bar above it, which carries in bearings upon it a small integrating disk, which touches and is set in motion by a large disk, which in its turn is driven at the rate of one revolution to the yard by a suitable beveled gear from one of the hindermost traveling wheels of the instrument. The driving gear to the large disk registers distances traveled in yards upon another counter. The moving counter bar has a pointer which indicates the draft at any time in pounds on an adjustable scale attached to the frame, and also a suitable arm, having a metallic pencil at its end, which will describe the variations of draft on a sheet of metallic paper wound round a cylinder, which is set in motion at will, at a speed proportional to the distance traveled. The ordinary saddle chain, usually attached to one of the shafts of the cart, is passed over a light wrought iron saddle suspended from one end of a lever; the load resting on the saddle, representing that on a horse's back, is registered on a spring balance at the other end of the lever. If found necessary for going down hill, "breeching" chains may be attached to the back end of the instrument, and in hauling carts a belly band may be passed beneath the instrument to avoid any risk of tilting backwards. For quickly testing the springs in the field, a bell crank lever is provided, having arms, one of which is connected with the main spindle, and the other can be loaded by known weights. The instrument is mounted upon a timber framed carriage, having four broad cast iron wheels. The carriage can be raised or lowered between moderate limits.

With this, as in other instruments, the actual number of foot pounds of work done in any experiment is determined by simply multiplying the register of the integrating counter by a constant depending on the spring in use. The product so obtained, divided by the number of feet run as indicated by the distance counter, gives the mean draft during the experiment. The actual draft at any time is indicated by the pointer, and also on the metallic card, if it is put into gear. It is obvious that this apparatus will have a very wide application, especially in the trial of reaping and mowing machines, portable engines, artillery, and in fact all vehicles drawn by shafts, and also in ascertaining the comparative resistances of roads for any given vehicle.

Dog Dentistry.

It is well known that the bites of rabid herbivorous animals are rarely dangerous, because their teeth are made flat-faced, for grinding their food without penetrating or tearing the tissues. Hence their bite is little more than a severe bruise, differing from that of a carnivorous animal, which pierces immediately through the skin. A veterinary surgeon of Paris, M. Bourrel, recently captured three mad dogs and, tightly securing them, proceeded to file down the teeth. These animals he let loose with six other dogs. The latter were immediately furiously attacked and frequently bitten, but in no case did the pointless teeth inflict more than a bruise. Not content with this, M. Bourrel put on a thin kid glove and then worried the mad dogs with his hand until they bit him several times. Although pinching quite hard, the glove was not broken in a single instance, while the skin beneath was uninjured.

As to whether we had better substitute a city dog dentist for the present pound master, we leave the question to the humanitarians who are endeavoring to abolish carbonic acid and the muzzle.

New Process of Determining the Alcohol in Wines.

If to a known volume of water larger and larger quantities of alcohol are added, the density and the superficial tension of the mixtures obtained are simultaneously diminished, and consequently there is an increase in the number of drops which they form if allowed to flow slowly from a given aperture. If this aperture has constant dimensions, the number of drops corresponding to each alcoholic mixture is constant also. The difference between the numbers thus found is large enough to furnish a basis for a very sensitive alcoholometric method. The instrument proposed is a pipette holding 0 3 cubic inch. It is filled with the alcoholic liquid under examination, and the number of drops escaping is counted. From this number the proportion of alcohol is calculated by the aid of tables which the author has drawn up. Slight traces of liquids more diffusible than alcohol, such as acetic ether, greatly increase the number of drops. —*M. Ducleaux.—Chemical News.*

Theory of Dissociation or Thermolysis.

The theory of dissociation may be summed up in the following propositions: 1. Dissociation is the opposite process to chemical combination, the gaseous body resuming its molecular motion which it lost on combination as heat, and converting it into a new form of motion. 2. The amount of heat which the dissociated bodies take up is exactly equal to that which they lose on combination. 3. The temperature of separation is higher than the temperature of combination. 4. Compounds whose constituents are not volatile cannot be separated by heat.—*Fr. Mohr.*

A New Double Ship.

Some years ago there were employed on what was then termed the Navy Yard Ferry, between New York and Brooklyn, a set of steam ferry boats having double hulls, propelled by a paddle wheel placed in the middle, between the hulls. The two vessels were coupled together by strong beams, and covered by a broad deck. These boats were roomy, and gave satisfaction except that they were slow.

Recently, in England, they have launched a new ferry boat, built on the above general plan, intended to ply across the English Channel, between Dover and Calais, 22 miles. At present they run very small boats, and passengers are greatly troubled with sea sickness. The new boat has two hulls, each 17 feet wide and 290 feet long, separated 26 feet, and united by a deck or superstructure 60 feet wide and 183 feet long. This makes a broad and comfortable boat for passengers, and will be a great improvement over the existing vessels. The new ship has been christened the Castalia. She will be propelled by a central wheel, with engines of great power. Each hull has a rudder at the bow and stern, making four rudders in all.

Palm Paper.

Mr. James P. Herron, of Washington, D. C., has invented a process of making paper from varieties of the palm. The material is cut or torn into pieces of suitable size, then cooked in a close digester, with thorough agitation and under steam pressure, in a weak solution of alkali, naphtha, benzine, or soap; then it is completely ground, while steam passes freely through the grinder and intermingles with the stock, reducing, bleaching, and finally washing it.

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THE CONVENTION OF THE CIVIL ENGINEERS.

We continue our abstract of the proceedings of this association.

Mr. G. W. R. Bayley, of New Orleans, La., followed, with an exhaustive communication on the subject of

THE TEREDO

or ship worm, well known for its ravages upon timber under water. It belongs to the first subclass of mollusca, known as *acephala*. Although having no head, the animal feeds itself and reproduces its kind. The body is surrounded by folds of the mantle, and it has a shell consisting of two valves. The animal secretes calcareous matter and deposits it upon the extreme edge of the shell, when the secretion hardens and becomes converted into a layer of solid testaceous substance. Every newly formed layer enlarges the diameter of the shell. The ship worm moves by means of an extensive fleshy organ called a foot. It is a muscular mass, capable of being pushed out from between the mantle lobes and the valves, and of adhering, by the exhaustion of the air and water under it, firmly to the front end of the tube, when the teredo is engaged in excavating or boring.

The long bridges across Bay St. Louis, 10,055 feet, and Bay Biloxi, 6,136 feet, built (on heavy, yellow pine piles from 15 to 20 inches and more in diameter) in 1869 and 1870, had to be reconstructed in the winter and spring of 1871 by driving an entire new set of piles in the place of those destroyed by the teredo. The Bay St. Louis bridge piles—the new ones—were covered with felt and copper, and the Beloxi bridge piles with felt and zinc, from the water line to the bottom, the depth of Bay St. Louis being from 10 to 12 generally, and at Biloxi Bay from 10 to 15 feet. In 1872 the writer found that many of the piles in the Bay St. Louis bridge had been damaged by the teredo below the coppering. To remedy the evil, sand and clay were hauled and dumped round the new piles in sufficient quantities to cover the exposed posts, thus cutting off the teredos' connection with the aerated salt water, and killing them in a few days. The piles much injured were replaced with new ones, previously charred, with coal of tar poured on them, washed with clear oil, and coated with coal tar varnish; and all loose or broken sheets of copper were renailed under water. It was estimated that this coppering, already considerably thinned by decomposition, was good for perhaps three or four years.

The teredo, cannot penetrate any soft, fibrous, or spongy substance, as felting, thick paper, or the bark of pine timber, and this is the reason why the spongy, fibrous wood of the cabbage tree palm is never attacked. The action of salt water upon copper or zinc sheets is very destructive, and tarred felt is even a better protection than metal for submerged timber; with metal only, the sea water can penetrate under the sheets, especially when loose or broken; and when sea water ebbs and flows with the tides, so can the ship worm enter and work. If felt, saturated with the dead oil of coal tar and well coated with thickened coal tar, can be secured to and maintained on the outside of submerged timber, it may be considered safe from the ravages of the teredo.

The partial report of the committee on the

MANUFACTURE OF RAILS

was next submitted. The English system of rails is not applicable to this country, as it requires strength, while the American system demands endurance and wear. Where there is the most wear of rail, strength should be the first consideration, and the rails should contain the greatest amount of metal; but where there is less wear, the rails should be as light as experience shows to be safe. As there is the most wear on the head of the rail, there should also be at that point the greatest amount of metal. There was no theory more erroneous than that a head of 2½ inches wide was more endurable than one three inches wide. With the present heavy machinery, the narrow high rails will not last as long as the low wide rails. An inflexible or rigid rail is more sure to break than one moderately flexible. If the rails were laid on a better foundation, and there were no frost, the rails might be made stiffer. In answer to the question why rails should not be made square, the committee believed that it would be too flexible, especially when of iron, and that rails with stem and base were much better. It would be even advisable to place 60 per cent of the metal in the head; but a double headed rail wears out faster than a single. The average wear of an iron rail is equal to a pressure of 4,000,000 tuns of dead weight, or 10,000,000 tuns of gross weight. The stone ballast of the American roads has been too large; and on a good road a rail would last fully 25 per cent longer than on a bad one. In cold weather, the metal is more brittle than in summer; consequently the breakage of rails in winter is greater in proportion. No definite figures had been received as to the comparative values of iron and steel rails, but the committee were of opinion that a steel rail was 20 per cent better than a good iron rail, 40 per cent better than a fair iron rail, and 100 per cent superior to the ordinary rail used on many railroads.

FIRE IN THE COAL FIELDS.

Mr. Martin Coryell, of Wilkesbarre, recited the particulars of the conflagration now existing in the coal at the Kidder slope. At first water was pumped out of the mines by locomotives; but subsequently, this proving unsuccessful, a new plan was adopted. Steam boilers were erected at various points, and the work of forcing steam into the mines was begun. This appears to be working with great success. At one time during the hight of the fire, the thermometer at the mouth of the air shaft registered 212 degrees. When 50 pounds of steam pressure were forced into the mine, the thermometer fell to 120°; and when 70 pounds pressure was introduced, the thermometer fell to 100°. The men are now at work boring a nine inch hole with a diamond drill, so as to be enabled to put in, at a different point, another stream of steam to aid the others. The work is apparent going on successfully. The steam has evidently created a great amount of carbonic acid gas; but as yet there have been no means of ascertaining the quantity thus created, or whether it was aiding the steam in doing the work of extinguishing the fire. The mines are at least 600 feet below the surface, and therefore very difficult to reach.

An interesting history of the

DOCK SYSTEM OF NEW YORK CITY

was given by Mr. John D. Van Buren. The speaker, after sketching the past dock facilities of the port and pointing out the advantages as a harbor, referred to the operations at present in progress.

The river wall, recommended by General McClellan and adopted by the present department, is composed of *béton* blocks weighing from 25 to 50 tuns each, extending from the foundation to within two feet of low water mark, and, above this level, concrete laid in mass, faced with ashlar granite masonry. The idea of using *béton* blocks for this arch is due, he said, entirely to General McClellan, and the late operations of the department show that the plan is an exceedingly expeditious and cheap one. On the Christopher street section, now being built by the department, 14 blocks, weighing about 450 tuns, were laid in one day, and 109 blocks, weighing 3,560 tuns, were loaded, transported, and laid in 18 days of from 10 to 12 hours each. The crew consists of 10 men, including captain and engineer. The total cost of loading, transporting, and laying, in 14 feet of water, will not exceed $1.50 per cubic yard. The cost of the blocks, exclusive of the rent of yards, is about $12.50 with cement at $5 per barrel, this material alone costing about $8.50 per cubic yard. It does not cost the city, considering all expenses, over $16 per cubic yard laid. This wall is being built considerably within the estimate, made by General McClellan, of $2,500,000 per mile, including the cost of filling.

The departments are now building four large wharves of wood on the Christopher street section, of an improved quality, and have nearly completed three of them. Another is built at Canal street, North river. In these structures they have not found it possible to allow the engineers to introduce any artificial preservatives, except external coatings of fish oil and paint: but in the general character and strength of the woodwork and fastenings, every care has been taken to make them complete and of the very best quality. The pile heads are the only novel features of these piers; they are constructed of built-up columns 20x20 in section and 75 feet length, placed in rows 12½ feet apart, and about 9½ feet apart in rows. The rows are sheathed for low water up to the girders on both sides with 5 inch planking, the ends of which are protected with boiler plates. The heads of the columns are securely passed into the caps and girders. The piles used in the pier, some of which are 94 feet long, are driven in rows 8 feet apart, and 5 feet apart in the row. The square timber is 12x12 in section.

The plan of construction, then, which seems to commend itself as the proper one for the improvement of the water front of New York is: To construct a quay wall along the main street of granite masonry, increasing the width of the street considerably, and from the wall to throw out piers of the very best quality of wood, preserved against decay by all possible means, and at once establish a broad main street and have good piers built and taken care of according to a settled plan; and it will shortly follow that all known means of facilitating the handling and transportation of freight will be introduced by the interested persons then under certain general restrictions.

These public works should go slowly on, say at the rate of half a mile per annum. If in 10 years the wall could be completed on the East river and to West 11th street on the North river, its progress would be all that could be desired. The city would then possess the finest dock facilities in the world.

THE EDUCATION OF CIVIL ENGINEERS

was the topic of a paper by Mr. Thomas C. Clarke, of Clarke, Reeves & Co., the well known iron bridge constructors. Mr. Clarke contrasted the English and Continental systems of professional education, and pointed out that the former was mainly practical, while the latter required the student to be thoroughly versed in theory before entering upon actual work. He believed in combining the advantages of both systems, and advocated a thorough training in the natural sciences. Too much time, the speaker said, was now wasted in studying the higher mathematics, which rarely are brought into practical use. The student should be limited to ordinary analysis, and the time thus gained devoted to the study of Nature. After graduating from college, practice in the field should be immediately begun, and then, after an insight had been obtained into the actual labor of the profession, the young engineer might profitably attend a technological school for the purpose of devoting himself to some specialty. In conclusion, reference was made to the late John Edgar Thompson, and his life was held up as an example of the value of concentration of energies upon business and of thorough training, by which the possessor was enabled to conduct the great operations under his control.

EXCURSIONS, ETC., OF THE CONVENTION.

The reading of papers being concluded, on the following day the delegates made visits to the Stevens Institute at Hoboken, where they inspected the Stevens Battery, and subsequently to the East river bridge, Hell Gate excavations, and Fourth avenue improvements. An excursion was also made to Ashley, Pa., the ascent of Wilksbarre Mountain accomplished, and the mines of the Wilkesbarre Coal and Iron Company examined. The journey terminated with a visit to Mauch Chunk, a ride over the Switch Back railway, and an inspection of the works of the Bethlehem Iron Company and the Lehigh Zinc Company at Bethlehem, Pa.

New Remedy for Dysentery.

In a recent issue of the *Archives de Médicine Navale* is published an official note, addressed by Dr. Robert, who is the medical chief of the naval division of China and Japan, to the Inspector General of the Health Service in the French navy, calling attention to a drug used by Chinese physicians in the treatment of dysentery. It consists of the root bark of the *ailanthus*, very common in China, also cultivated in France and in this country.

The bark of the root is the only part employed. An infusion of the bark, however, exhales a slightly nauseous odor, and possesses an excessive bitterness, resembling that of sulphate of quinia. The Chinese physicians employ the root in the fresh state only; but Dr. Robert, having been compelled to use some that had become dry, found no sensible difference in its action in the two states.

For administration, 1½ ounces weight of the root is cut into very small pieces and triturated with 2 ounces of hot water for a few minutes in a mortar, in order to soften the bark, and then strained. A teaspoonful of this strong infusion is administered as a dose morning and evening, alone or in a cup of tea. Taken in this form, it provokes vomiting. The medicine is administered in this manner during three days, the patient being kept upon full diet. After that time the ailanthus is omitted and the diet is altered to broths until health is restored. If after eight days' treatment the patient is not cured, the Chinese physicians recommence the use of the ailanthus; but Dr. Robert states that he has not met with a single case in which this resumption has been necessary, although he had under his notice some where the disease had lasted several months, as well as others of more recent origin.

The principal symptoms which follow the administration of the ailanthus are said to be nausea, and sometimes vomiting, followed by a temporary lowering of the pulse. The disappearance of blood from the evacuations commences on the first day and is completed on the second; the colic ceases a little later. The effect of the drug upon the color of the evacuations is variable. Dr. Robert sums up by expressing his opinion that the administration of the ailanthus gave superior results to those of ipecacuanha, astringents, alone or combined with opiates, or calomel.

French Improvements in Manufacturing Steel.

Those who have followed for the last dozen years the progressive steps in the manufacture of steel know the difficulties which surrounded the first efforts in the Bessemer process. These were not thoroughly surmounted, nor the process rendered thoroughly practical, until the idea was struck of pushing the refining process to complete decarburation, and then adding to the bath a certain proportion of iron rich in manganese, called spiegelesen. The object of this seemed to be to add again to the metal the necessary quantity of carbon to make it steel, and also to give it, at the same time, certain mysterious virtues, which were known as a steely propensity. It was soon recognized that the importance of this addition was more considerable than at first supposed. The best gray irons were not suitable to replace the spiegeleisen. It follows, then, that the manganese must affect the iron in a useful manner. A more minute investigation of the process shows that, under complete reduction of the carbon, the iron becomes oxidized and brittle, and the action of the manganese is to destroy this excessive oxidation, and to restore to the metal its original good qualities.

In the Martin Siemens process, also, the addition of a manganesic iron was recognized from the first as practical and necessary. This method answered all requirements for rolled rails and such goods; but a demand arose for a metal milder and softer, for plates and parts of machines. Here this addition of spiegeleisen involved a serious dilemma. For with the necessary quantity of manganese must be introduced so large a quantity of carbon that the hardness was produced, which was precisely the thing wished to be avoided. There was then no other resource than to push the reduction of the carbon further still, so as to be perfectly sure of total removal of the carbon, and then, by the addition of a quantity of spiegeleisen as rich as possible, to get a minimum of carbon in the resulting steel. This is, at best, but an uncertain and dangerous method, though much in use at present, and is very liable to give a result too hard, or still very oxidized and brittle.

The company of Terre Noire sets itself to produce alloys of iron and manganese, and claims to be able to make alloys of iron with manganese having forty to seventy per cent of the latter, and that, so to speak, in illimitable quantity. This gives a metal very mild, but with all the tenacity of steel. Another great field for the use of ferro-manganese has been unexpectedly discovered, both by the company at Terre Noire and, independently, elsewhere. A series of experiments had been made, upon ores of inferior quality and with large admixture of phosphorus. In seeking to purify or use these ores in some way, it was found, most unexpectedly, that the phosphorus was no detriment to the laminability and tenacity of the metal, provided that the carbon, combined with the manganese, was very small indeed. Here is a great field for the use of ferro-manganese—to produce mild steel from many second rate brands of iron. This renders the working up of all the old material of wrought iron rails into steel, which opens a most valuable market for the old permanent way of many railways.

The above details give sufficient grounds for supposing that

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ferro manganese will become quite in large demand, and hence give ample employ to any company undertaking the special manufacture and application of it. The following is what this French company proposes to undertake:

1. The sale and manufacture of alloys of iron and manganese. 2. The application of those alloys to the production of metal with all the properties of mild steel. 3. The application of these alloys to the production of steel more or less phosphoric, either by the Bessemer or the Martin-Siemens process. 4. The fixing and making of all plant suitable for these productions and applications.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE NEWLY DISCOVERED CRATER OF MAUI.

Mr. T. M. Alexander, in a letter to the *Hawaiian Gazette*, gives an interesting account of his discovery of very remarkable volcanic phenomena on West Maui, one of the Sandwich Islands. He found a crater in which were nearly a score of volcanic pits, not cones, from fifteen to fifty feet broad, and ten to twenty feet deep, with shrubbery within concealing the chasms below. From six of the pits columns of steam or smoke were rising, which were destitute of sulphurous fumes and had very little warmth. It is believed that these pits are connected with subterranean chambers heated by volcanic action, and that the air arising from the warm depths on a cold morning becomes changed to fumes of steam. No similar instance is found on any of the islands except Hawaii.

PROGRESS OF THE EAST RIVER BRIDGE.

Work upon the great suspension bridge between Brooklyn and New York, which has been temporarily suspended, is now resumed. The Brooklyn tower has reached an elevation of 222 feet above high water mark, leaving 40 feet of masonry yet to be laid. The workmen are engaged upon the arches, several courses of which are in position. The keystones will weigh ten tuns each, and constitute the heaviest blocks in the structure, the ordinary stones weighing some three tuns. It is expected that before winter the "saddles" or castings over which the cables will pass will be in position.

The New York tower is now 123 feet high, and will probably reach 200 feet during the present season. The anchorage on the Brooklyn side is 6 feet high, and contains 8,334 cubic feet of masonry. Its total elevation will be 66 feet. On the New York anchorage, or on the approaches, work has not yet been begun.

THE GERM THEORY OF DISEASE.

That hay fever, a disease quite prevalent during the present month, is traceable to vegetable organisms, is a curious discovery, tending toward the confirmation of the theory that disease is originated and propagated by independent organic germs, recently made by Professor Binz, of Bonn. The investigator has been himself subject to the malady, and has pursued his researches over a number of years.

On examining the nasal secretions with a powerful immersion lens, he found the organisms to be absent except when the disease attacked him during spring. Then the parasitical bodies were clearly seen in motion, vibrating on the slide and increasing in size after several days. By using a neutral solution of sulphate of quinine, applied by the nasal douche, Professor Binz found that the animalcuæ were completely destroyed, and that subsequent examination failed to show their existence in the secretions.

A SIMPLE ANALYSIS OF ARABLE EARTH.

M. Schlösing gives the following simple process for separating the clay in soils from other constituents, and consequently for determining the quantity of the former present.

The earth is thrown in water and the calcareous matter is eliminated by means of hydrochloric or other suitable acid. The carbonate of lime and humic acid, found in nearly all vegetable earth, hinders the clay from remaining in suspension in the water, and it is hence precipitated. By treating the liquor with ammonia, the humic acid is removed. The residue is composed of sandy matter and clay; but the former falls to the bottom, leaving the clay in suspension in the liquid, from which it may be separated by decantation. This method, though almost mechanical, it is said, will prove of much value to agriculturists. M. Schlösing has found that earths, considered argillaceous, in some cases contained little over 2 or 3 per cent of clay, while others, supposed to be composed almost entirely of that substance, contained but 30 per cent.

CORROSION OF TIN.

Tin is generally regarded as the least liable to change of all our common metals; but a case, recently reported to the American Academy of Arts and Sciences by Mr. S. R. Sharples, State Assayer of Massachusetts, cites a circumstance which appears to be wholly contradictory to such a theory. A tank, belonging to an hotel in Collinsville, Conn., was lined with block tin containing less than 2 per cent of impurities. Some time after the construction of the receptacle, white deposits were noticed upon the lining, and the owners, fearing that the water might be rendered deleterious, sent specimens of the powder and of the water to Mr. Sharples for analysis. The white powder proved to be oxide of tin with a mere trace of iron, and the water, which was led to the tank through 100 feet of lead pipe, was entirely free from the latter metal.

During the month of March last, an interval of nearly two years having elapsed since the above examination and the tank lining being some five years old, the proprietors called Mr. Sharples' attention to the fact that the lining had become perfectly riddled by corrosion, and this although there had been a free and constant circulation of fresh water, an analysis of which showed even better results than before. There were 4·20 parts of inorganic matter and 0·80 parts of organic matter in 100,000, and no nitrates were present.

This extensive corrosion can hardly be accounted for, as the weight of present authority points strongly to the unalterability of tin under similar circumstances.

Sir Charles Fox.

Sir Charles Fox, the distinguished civil engineer, died recently in England, aged 64 years. He was an assistant to the celebrated Robert Stephenson, by whom he was appointed assistant engineer of the London and Birmingham railway when that work was begun. Mr. Fox's greatest engineering work was the construction of the building for the Great Exhibition in Hyde Park, London, in 1851. He received the honor of knighthood in recognition of the genius and skill exhibited in this magnificent structure. He also re-constructed the same building for the Crystal Palace at Sydenham, and executed many extensive railway and other engineering works. He was the senior partner in the firm of Sir Charles Fox & Sons, civil engineers.

Hospital Hygiene.

Dr. Alphonse Guérin, an eminent surgeon of the Hotel Dieu in Paris, has recently presented to the French Academy of Sciences a remarkable memoir on the influence of atmospheric germs on surgical maladies, in which he strongly advocates tow dressings for wounds. He states that, when this material is packed upon the injured part, the pus is completely preserved from putrid fermentation. He uses the tow in brief as a filter for the air, which circulates freely through it, and in fact produces an arrangement precisely analogous to the cotton wool respirator mentioned by Professor Tyndall in his paper on haze and dust.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

PATENT HAIR NET.—JOSEPH DALTON *vs.* ABRAHAM G. JENNINGS.

[In equity.—Before Blatchford, Judge.—Decided May 21, 1874.]

Blatchford, *Judge:*

This suit is brought on letters patent granted to the plaintiff March 5 1872, for an "Improvement in Ladies' Hair Nets." The specification says:

The claim is a head or hair net, composed of a main set of meshes fabricated of coarse thread, combined with an auxiliary set or sets of meshes fabricated of fine thread, substantially as described.

The tenor of the specification and claim show that the intention was to have the claim cover broadly a head or hair net composed of a main set of meshes fabricated of coarse thread, combined with an auxiliary set or sets of meshes fabricated of fine thread, without reference to the degree of fineness of the finer threads, and without reference to the manner of tying the finer threads to the coarse threads. The history of the steps which led to the making, by the inventor, of the net described in the patent shows that he started with a net of large squares made by large threads and filled up partially the large squares by crossings of finer threads But the net thus arrived at was not a different net from what would have resulted if he had taken a net of small squares, sufficiently small to keep short hairs from protruding, such small squares being formed by fine threads, and all the threads of the net being of uniform size, and had substituted for each alternate fine thread, in both directions, a coarse thread, so as to arrive at a net like the patented net. Now, such a head or hair net, of small squares sufficiently small to keep short hairs from protruding, such small squares being formed by threads which were so small as to be entitled to be called fine threads, and were at a certain and reasonable distance away invisible, all the threads of the net being of uniform size, existed prior to the plaintiff's invention. It is defendant's exhibit No. 10. In such a net, to substitute for each alternate fine thread, in both directions, a coarse thread, cannot be the production of a new article of manufacture. Such substitution produces the patented net. It may be new as a design, and may be entitled to be patented as a design; but it is not a new article of manufacture. The specification sets forth, as the advantages of the patented net, only the preventing of the protruding of short hairs and the invisibility of the fine threads. But any person has a right to make defendant's exhibit No. 10 of as fine threads as should be desirable, and to make it of uniform finer threads or of uniform coarser threads would involve no invention. As it stands, it will prevent short hairs from protruding. The substitution of alternate coarse threads in it for the fine threads has no effect one way or the other on the protruding of short hairs or on the invisibility of the fine threads. No point of advantage as between the patented net and defendant's exhibit No. 10 is or can be suggested, except as to mere ornament or taste or outline in pleasing the eye. The fabrics, as to utility, structure, inherent qualities, and mode of operation in use, are the same. The patented net, in view of the former net, has no patentability, if the claim of the patent is to be construed in the broad manner before suggested

If the claim, to sustain it in view of the former net, is to be limited to a claim to the combination of two sets of threads when they are so connected with each other that either set can be entirely broken away without destroying the other, then the defendant has not infringed. The defendant's net although it has a series of finer threads crossing each other between the coarse threads, so as to prevent short hairs from protruding, does not have its threads so connected that either set can be entirely broken away without destroying the other.

The bill must be dismissed with costs.

[*J. Van Santvoord* for the plaintiff.
A. V. Briesen for the defendant.]

NEW BOOKS AND PUBLICATIONS.

THE TUNNELS AND WATER SYSTEM OF CHICAGO—Under the Lake and Under the River. Illustrated. Chicago: J. M. Wing & Co.

This handsome volume gives a complete and interesting account of the extensive system of tunnels in Chicago, by which water supply and subaqueous communication is obtained in that enterprising city. It is written throughout in a loquacious, humorous style, and contains several engravings that are even more comic than the literature.

KINDERGARTEN TOYS, AND HOW TO USE THEM. A Practical Explanation of the First Six Gifts of Fröbel's Kindergarten. By Heinrich Hoffmann. New York: E. Steiger, 22 & 24 Frankfort street.

This book contains full explanations of the *kindergarten* apparatus, which, on account of its simplicity, gradual progressiveness, and accuracy, is the most effectual method of imparting instruction to very young children, and has the especial merit of being thoroughly amusing to the little pupil. The child's eye is taught to distinguish form, color and number, by playing with such toys as are usually given to the merest infant.

THE AMERICAN YACHT LIST FOR 1874, containing a Complete Register of the Yacht Clubs of the United States and Canada. Compiled by Niels Olsen, Steward of the New York Yacht Club. Price $1. New York: L. H. Biglow & Co., 13 William street.

In addition to the information specified in the above title, this well arranged volume contains illustrations of all the ensigns and signals of the various yacht clubs.

THE PRINCIPLES OF SCIENCE—A Treatise on Logic and Scientific Method. By W. Stanley Jevons, M.A., F.R.S., etc. Special American Edition. New York: Macmillan & Co.

In his "Scientific Use of the Imagination," Professor Tyndall has, in popular language, conveyed a clear idea of the mental processes by which the investigator is enabled to proceed from the known to the unknown He briefly touches upon the course of reasoning which detects analogies leading to a great discovery, or upsetting, in the end, pre-existing and accepted theories; but he necessarily does not conduct us into the details, or trace, step by step, the general logical and systematic operation of the mind by which certain and absolute results are alone reached. This lacking need in our scientific knowledge, Professor Jevons has supplied in the work before us—a volume which should command the careful study of those whose object is that cardinal aspiration of the modern scientist—original research and discovery. The author describes his book as "a simple and general description of the devices by which exact measurement is effected, errors eliminated, a probable mean result attained, and the probable error of that mean ascertained." He illustrates the conditions and precautions requisite for accurate observation, for successful experiment, and for the sure detection of the quantitative laws of Nature. In a word, he tells us how to question Nature in order to obtain those responses which of all things are alone infallible.

A UNIVERSAL TABLE FOR EXCAVATIONS AND EMBANKMENTS, applicable to any Base or Slope Whatever; and the Calculations of All Solids to which the Prismoidal Formula is Applicable. By William Zimmerman, C. E.

This is a very elaborately calculated table of the measurement of earthwork, applicable to every possible configuration of cross section of cuttings and embankments. It is well illustrated with diagrams, showing its universal use for the work for which it is intended, and for which engineers and contractors will find it especially valuable.

The sixth volume of the new edition of the AMERICAN CYCLOPÆDIA, published by Messrs. D. Appleton & Co., of this city, has recently appeared. We know of no work in which there is a more copious supply of information, brought down to the latest dates, or in which the possessor can be more truly said to have placed at his disposal a digest of everything that has been written upon almost every conceivable subject. The volume before us is particularly rich in its scientific department. There are four astronomical papers by Professor Proctor, and a number of exhaustive chemical articles by Professor Joy; while the treatises on physical and medical topics are from the pens of Drs. Hogeboom, Clarke, Flint, Dalton and Edes, and Professors Abbé, Hunt, Kneeland and others. Count Pourtalés, of the Coast Survey, contributes a valuable account of deep sea dredging, in which is contained a *resume* of the most recent investigations of the ocean bed and its odd inhabitants. Volume VI., like its predecessors, is copiously illustrated with excellent engravings, a feature of much value, and tending to give additional interest to the subjects treated of in the text.

The July number of that admirable children's magazine, ST. NICHOLAS, is superlatively good. The literature for the youth of this country is, as a general rule, so much of the morbidly mawkish order—we know of no better term to express its nature—treats so much of those intensely well behaved children who are always doing such exasperatingly charitable and aggravatingly good actions—that we feel a genuine satisfaction in turning over the pages of a work that tells the youngsters stories which we know they will read and reread until the very paper becomes worn and limp with innumerable fingermarks. While none believe in making piety and upright living more attractive to the children than ourselves, we have no patience with the trash which aims to convert a healthy, rosy-cheeked, earthly imp into an incipient theologian or a pocket model of sanctity whose joys are not of this world, and whose existence is mainly spent in "getting licked" and thereupon tearfully forgiving his aggressor. The issue of ST. NICHOLAS before us has an excellent story, by Bret Harte, about a juvenile bear, which will provoke many a hearty laugh, and to which Beard, the artist, contributes a sketch of the hero, drawn as only he can draw bears. Then there is a table of contents and a lot of pictures, which we cannot pretend to describe, but which are sure to delight the young ones, and the old ones for that matter, too. Besides, as if all this were not enough, ST. NICHOLAS proudly announces that, not content with swallowing "Our Young Folks" some time since, he has exercised his cannibalistic propensities on the "Children's Hour," and, in the future, will have a three-fold claim upon the notice of his juvenile readers. If we were a youngster, we think we should tease hard for the necessary three dollars for a year's subscription, and lose not a moment in forwarding the money to Messrs. Scribner & Co., at 654 Broadway, New York.

SCRIBNER'S MONTHLY, for July, opens with a continuation of Edgar King's Papers on the Great South, in which the history, resources, and enterprise of Missouri are described with considerable detail. Professor Hartt contributes a valuable article on "The Shakspeare Death Mask," which is copiously illustrated, and which gives many interesting facts regarding the existing and much disputed likeness of the great poet. More instalments of the serial stories, including Jules Verne's fanciful account of the Mysterious Island, a few choice poems, and other interesting matter, besides the usual Editorial Miscellany, complete a varied and excellent table of contents. Subscription $4 a year. Published by Scribner & Co., 654 Broadway, New York.

SCRIBNER'S MAGAZINE for July contains an excellent variety of contents, among them illustrations of the Heart of the Republic, which refer especially to the City of St. Louis, and include a view of the new bridge at that place.

GODEY'S MAGAZINE for July is as attractive as ever. This number is the first of the forty-fifth year of the work.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From May 22 to May 28, 1874, inclusive.

CARBURETTING AIR, ETC.—J. M. Cayce, Franklin, Tenn.
CAR COUPLING.—W. Todd, Portland, Me.
IRON AND STEEL MANUFACTURE.—E. Peckham, Antwerp, N. Y.
MOWER AND REAPER.—W. A. Wood, Albany, N. Y.
REDUCING IRON ORES, ETC.—N. W. Wheeler, New York city.
SPINNING AND WINDING FIBERS, ETC —G. Draper *et al.*, Hopedale, Mass
STEEL SHOVELS, ETC.—T. J. Blake, Pittsburgh, Pa.
STRAW FABRICS, ETC.—N. A. Baldwin, Milford, Conn.
TOY.—W. W. Rose, New York city.
YEAST POWDER, ETC.—E. P. Eastwick, New York city.
WOOL CARD EVENER.—F. F. Burlock, Birmingham, Conn.

Recent American and Foreign Patents.

Improved Building Block.

Thomas B. Rhodes, Leetonia, O.—This invention relates to an improved building block formed of concrete or other material, which in its plastic condition may be molded into the required form, and will become sufficiently hard and durable for making permanent fireproof walls or structures. Hollow spaces extend through the blocks from bottom to top, to make hollow walls. The parts by which the two sides of the blocks are connected are arranged sufficiently distant from the ends to form grooves therein, in which tongues on other blocks will fit to lock the blocks firmly together. A groove may be formed in one end of a block and a tongue in the other. These grooves and tongues may be in dovetail form. Long binders of wood or iron, extending from end to end of a wall at the top, or from bottom to top, are used. The openings in the top blocks may be arranged so that hot air admitted to them may circulate throughout the spaces in all outside walls, and in partitions, if preferred, for heating the rooms. In laying up a wall, it is proposed to enclose each layer temporarily in a casing of wood, and pour in hot cement to flow into the interstices and fill them up and unite the blocks.

Improved Electrical Condenser.

Charles A. Browne and Isaac S. Browne, North Adams, Mass.—This invention relates to the construction of Leyden jars or condensers, composed of india rubber plates with embedded tin foil sheets; and it consists in so constructing the condenser in sections that, in case a rubber plate is ruptured by a spark, the damage can be repaired by simply readjusting the sections, or, at most, by the loss of a section only instead of the whole jar, as when all the plates are vulcanized together.

Improved Trunk.

William J. Large, South Brooklyn, N. Y.—To the till of the trunk are attached bars, which slide up and down in ways in the trunk body. By suitable mechanism, by raising the lid to open the trunk, the till will also be raised, giving convenient access to the interior. When the lid is raised, a slotted bar drops over a screw to support the said lid and the till. Arrangements are connected with the till to adapt the same for use as a writing desk.

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Improved Street Car Awning.

Joseph T. Craw, Jersey City, N. J.—This invention has for its object to provide an improved awning for the end platforms of street cars, which may be extended to a greater or less extent as conditions require. The invention consists in an apron or curtain attached to a roller and to an adjustable or extensible frame, which are so connected by rack, bar, and pinion that the curtain is unwound from the roller when the frame is extended, and rewound thereon when the frame is retracted or drawn back to adapt the awning for varying conditions of the weather.

Improved Folding Chair.

Ephraim Tucker, Worcester, Mass.—This invention consists in combining angular plates and pivoted connecting straps with the posts, seat, and back of a folding chair.

Improved Base Burning Stove.

Howard Greentree, Baltimore, Md.—This invention consists in a firebox hearth made of two imperforate parts, the lower made in sliding sections, and in a correspondingly perforated flange and ring to admit air to the fuel for supporting combustion between the firebox and the shell of fire chamber.

Improved Egg Carrier.

William O. Strong, Ypsilanti, Mich.—This invention relates to forming the carrier of a slitted paper strip in such a manner that it is rendered more durable than other carriers of its class, the ends of the several interlocked parts or sections of the strip being joined together on the sides of the body of the carrier to prevent wear and protect the eggs from being broken by concussion.

Improved Upright Drilling Machine.

Frederick E. Reed, Worcester, Mass.—This invention is an improvement in the class of upright drilling machines in which a weight is employed to balance the spindle and its attached drill. The invention relates to prevention of backlash by means, chiefly, of a chain, a roll or cylinder, and adjusting screws; also to the arrangement for enabling the drill spindle to be quickly removed from or reinserted in the hole made by it, part of the same devices being employed for the purpose as are used for ordinary slow feeding of the drill.

Improved Hay and Cotton Press.

Micheal Mickelson, Ashland, Oregon, assignor to Orson A. Davis, same place. This invention relates to the combination of locking and releasing devices with the toothed bars and stirrups or pawls by which the follower is operated. To one of the side arms of the stirrups is pivoted a short lever, the inner end of which strikes against the other stirrup, raising said stirrup away from the teeth of the bar. As the stirrup is raised it strikes against the stop attached to the follow beam, and is stopped, which causes the said lever to raise the other stirrup, in which position the lever, stirrup, and stop lock themselves so that the follower may be raised freely. As the follower rises, a pin attached to the inner end of the lever strikes against a stop attached to the framework of the press, which disengages the lever and allows the stirrups to drop, ready to take hold of the teeth of the bars when the lever is again operated.

Improved Stove Pipe Elbow.

Samuel Smith, Brooklyn, N.Y.—This invention is an adjustable stovepipe elbow constructed of central and outermost rectangular sections, with overlapping intermediate sections, of which the outer sections are riveted to slotted connecting strips, and adjustable by a thumb screw to the central strip.

Improved Girder for Iron Bridges.

Cyrus W. Wheeler, Brownsville, Neb.—The object of this invention is to construct girders for arch and truss bridges which require less riveting. The invention consists of a tubular girder produced of two quadrantal flanged sections, riveted to a longitudinal strengthening piece and connected by a stiffening chord, and a quadrantal lower section of wrought iron.

Improved Preserving Apparatus.

John Peter Schmitz, San Francisco, Cal.—This invention comprises an improved tank having a transverse vertical slotted partition which may be readily closed after the vacuum has been created by the consumption of oxygen in the other or contiguous department, thus permanently excluding air. The burner to which the fluid is supplied is ignited by a taper or electric wire which is inserted through a slot in the end wall of the tank.

Improved Car Coupling.

Henry D. Goldsmith, New York city.—The adjacent drawheads of two contiguous cars have long transverse notches formed in them to receive the cross bars which are bolted to the framework of the cars, and with which the said drawheads are connected by rods which pass through the said bars, so as to support the drawheads and allow them to have a longitudinal play. One drawhead is slotted longitudinally to receive a pivoted coupling bar, the outer end of which is beveled off, and has a notch formed in its upper side to catch upon the catch plate of the other drawhead. The inner end of the coupling bar is made the heavier, so as to hold its outer end raised. The hight to which the outer end of the coupling bar rises is regulated by a set screw. The rear end of a lever is pivoted to the drawhead, and to its middle part is attached a chain which passes up through the platform and around guide pulleys. Its upper end is attached to the lower end of a pin attached to said platform. The chain is made of such a length as to prevent the forward end of the lever from dropping too low. The forward end of the lever is supported below the inner end of the coupling bar, so that, by pulling upon the chain, the said coupling bar is lowered to detach it from the catch plate of the drawhead. The chain is connected with a rod, that slides in keepers attached to the forward edge of the platform, so that, by pulling upon the rod, the cars may be uncoupled from the side of the track. The forward end of the second drawhead is beveled, and upon its lower side is formed a recess to receive the notched outer end of the coupling bar. To the inclined forward end of the same drawhead is secured a steel plate, the lower end of which is notched to receive the notched end of the coupling bar. A spring projects beneath the end of the coupling bar to prevent it from jarring off the catch plate.

Improved Beer Cooler.

Wenzel Toepfer, Milwaukee, Wis.—The floor and ends of the cooling pan are composed of metal plates with beveled edges and other plates with a beveled strip. The strips are arranged with their beveled edges reversely to the edges of the first plates, so that, when the latter are placed on the upper side of the second plates and pressed against the strips, they lock together and make tight joints. The plates and strips are bent up at the ends, where they extend the whole length of the pan to form the two sides. They are clamped together by a cleat fastened at one end to one plate, passing under the other plate to the other side, and entering a clip attached to the first plate, which holds it from springing away, while a key is driven in between its shoulder and a cleat riveted fast to the first plate.

Improved Car Coupling.

James Leith, Ridgway, Pa., assignor to himself and William T. Burdett, same place.—The drawheads are made U-shaped, and are secured to the cars in the ordinary way. To the inner surface of one side of each of the bumper heads is attached a bar which enters the mouth of the opposite bumper head. The forward ends of the bars are beveled off, and have hooks which catch upon square pins held out by springs. The pins pass down between two pairs of short cross bars formed upon the drawheads. To the pins are attached chains which pass through holes in the opposite sides of the drawheads, and with the middle part of which is connected the end of a lever. The latter is pivoted to the side of said drawhead, and its free end projects so as to pass along the side of the opposite drawhead as the cars are run together. Other levers are pivoted to the drawheads opposite the hooks, and are so arranged that, as the cars are run together, the first levers may pass between them and the sides of the drawheads. To the second levers are attached arms which, as the said levers are drawn inward, strike against the loops, the arms of which pass in through holes in the sides of the drawheads, so that the pins may be forced away from the hooks, uncoupling the cars. The same inward movement of the second lever of either drawhead also operates the first lever of the other drawhead, to withdraw the pin of said other drawhead, so that the coupling may be uncoupled by operating the second lever of either drawhead.

Improved Feed Pump for Steam Boilers.

Thomas Warswick, Guelph, Can.—This invention relates to means of connection between a rotary horizontal shaft and vertical reciprocating shaft or plunger, whereby the length of stroke of the latter may be varied with convenience and dispatch.

Improved Bridle Bit.

Andrew Jackson Slaughter, Okolona, Miss.—This invention relates to constructing a bridle bit with lever, so that great pressure can be exerted on the tongue and jaw of the animal without the power on his part of evading the pressure by opening his mouth. The invention consists in making the mouthpiece with a crook, so that it will always remain on the tongue, and the upright levers of such a shape that a great advantage of leverage is secured.

Improved Wheelwright Machine.

William R. Perry, Gaines, Pa.- An eccentric lever is connected with the wheel by means of two straps, a central bolt, and a fulcrum pin. The straps are provided with a series of holes, so that the device may be applied to wheels of different diameters. The straps turn on the pivot bolt, and the lever is carried around from one spoke to another. The felly is thus pressed to the spokes without bruising or battering it with a hammer, and a rapid and permanent manner.

Improved Mode of and Tool for Capping Cans.

Richard H. Smith, Baltimore, Md.—This invention is based in part on the principle of the compound blowpipe, air and gas being conducted to the device in separate tubes and commingled at a point contiguous to the copper. The latter is in the form of a sheet or thin plate, which is readily heated by the flame that impinges on it through a slot in the back of the holder, and it is adjusted downward and clamped as required by means of a screw. The copper holder is secured in a socket which is provided with trunnions, and may be clamped in any desired adjustment to hold the copper inclined at various angles to the center on which the brace revolves. The brace is of the form of that used by carpenters for holding boring bits, and is revolved to carry the copper over the seam or joint in which bits of solder have been previously placed.

Improved Machine for Grinding Lenses.

Frederick R. Sutton and William O. Sutton, Wellington, Ill.—The holder for the lens to be ground revolves in a horizontal plane on a vertical axis, and the grinder revolves in a vertical plane on a horizontal axis. The inner periphery of the grinder works in contact with the face of the lens for grinding convex lenses.

Improved Curtain Fastening.

Aaron T. Rice, Reaville, N. J.—This fastening is formed of annular metallic plates and a slitted elastic disk. Said plates have semi-circular notches in their inner edge to receive or fit the shank of the knob or button, and the disk is slitted diagonally from the lower side so that a triangular tongue is formed which passes behind the head of the knob or button, and assists in preventing the fastening from getting detached.

Improved Railway Car Wheel.

George W. Miltimore, Janesville, Wis.—This invention relates to wheels generally, but mainly car wheels, and consists in means for taking up the shock thereon, and of locking the bushing or journal box and its collar to the hub of the wheel.

Improved Photographic Printing Frame.

Isaac M. Van Wagner, Nyack, N. Y., and Ezra P. Griswold, New York city.—This invention relates to apparatus for printing photographic pictures, and consists in an adjustable vignetting attachment to the ordinary printing frame now in use, by means of which the light opening, by means of longitudinal and transverse or other movable slides, is adjusted to the picture on the negative. It also consists in a device for varying the distance and position of the light opening from the negative. It also consists in a contracting and expanding diaphragm for varying the form and size of the light opening.

Improved Buckle.

George L. Robinson, Waterbury, Conn.—This buckle consists of a staple-shaped wire, having two parallel bars made zigzag, which pass through a cross bar. This cross bar slides back and forth on the bars, and is held in position by the angles, and to it is attached a pin having a loop handle. The pin and handle revolve loosely on the cross bar. The bars are attached to a bail-shaped wire. The pin has short bends in it, which fit over the wire when the buckle is attached to the fabric.

Improved Lawn Mower.

Sidney D. King, Middletown, N. Y.—This invention relates to a machine especially adapted for cutting high grass, and consists in two sets of revolving cutters, arranged in a frame in such a way that one set severs the upper portion of the high grass, and the second or rear set works close to the ground. The machine is also adapted for cutting short grass, like others of its class.

Improved Loom Picker Stick Check.

Benjamin Bury, Fall River, Mass.—This invention relates to looms for weaving cotton, and consists in a new and improved device for checking and stopping the picker staff. The check bar is passed between two cords, and the cord is twisted to any desired degree of tension, thereby forming a spring, the action of which is imparted to the picker staff by the bar.

Improved Sash Fastener.

Shepherd W. Reed, Waterloo, Iowa.—This consists of a sliding bolt which locks into recesses of the window frame, being operated by a pivoted latch with notches and a projecting pin or lug, and fastened to a slotted guide piece after the bolt is pushed forward.

Improved Fire Alarm.

Percy Albert Blake, Highbury, England.—This invention is an improvement in self-acting fire alarms, in which adjustable fuses are arranged to traverse the various rooms or parts of a building, and connect with an explosive cartridge or alarm bell, which will be exploded or rung to indicate the existence of a fire in any portion of the building. The invention relates specifically to so connecting a series of branch fuses with a main fuse that, while any one of the former may ignite the latter, the latter cannot ignite the former. Hence, when a fire breaks out, the contiguous branch fuses will unite the main fuse, which, while giving the alarm, will not ignite any other branch fuse.

Improved Temporary Binder.

William A. Harwood, Brooklyn, N.Y.—This is a little case of sheet metal for temporarily holding one or more paper fasteners to receive the papers. There is a spring presser on the top, for pressing down and holding the papers on the fasteners. The device is so contrived that the papers to be filed will be secured at the left hand corner only, whereby the separation of the papers for inspection in the file, also in the package when removed from the file and secured together by the fasteners, may be readily effected.

Improved Culinary Vessel.

Laurence P. Bodkin, Brooklyn, N. Y.—Upon the edge of the vessel is formed a lip, to serve as a spout, in which is a strainer, secured in place by a single screw. The cover has a loose flap which closes the spout aperture, but swings open when the vessel is tilted. The main portion of the cover is held in place by spring catches.

Improved Bed Bottom.

Jonathan V. Taylor, La Cygne, Kan.—This is a flexible bed bottom, which consists in cords attached to head and foot frames, composed of transverse bars connected by longitudinal arms. The end bars of said frames are provided with projecting journals, which are fitted in inclined grooves, so that when the bed bottom is depressed the end frames will turn or oscillate for causing the pressure to bear against the under side of the bottom. The central portion of the latter will thus be elevated, obtaining a taut surface.

Improved Loom Shuttle.

Norman A. Williams, Utica, N. Y.—This is an improved spring mechanism for holding the spindle either in the elevated position for receiving the bobbin or cop, or in the position for delivering the yarn in weaving, and at the same time allowing of moving the spindle readily from one position to the other.

Improved Pitman Connection.

James Timms, Malta, assignor to himself, Hugh M. Cochran, and Joseph F. Sonnastine, McConnellsville, Ohio.—This is an improved device for taking up wear and the consequent lost motion. The invention consists in the combination of the sleeve or bearing and the lock nuts with the head or lug of the sickle bar, and the pitman having a screw thread cut upon it. A sickle bar has a lug to receive a hook on the end of the pitman. Upon the lower part of the latter is placed a sleeve, upon which is formed a toe, which is recessed to fit upon the sickle bar head. The sleeve is held down by lock nuts, placed upon a screw thread cut upon the pitman. By this construction, by turning down the nuts, the wear will be taken up to prevent lost motion caused by the wear, so that the hook can be used until worn out.

Improved Sewing Machine Caster.

William J. C. Gaar, Whitesburgh, Ga.—There is a rock shaft on each end frame of the stand, near the bottom, at right angles to the treadle shaft, carrying a castor in the outer end of an arm near each end. This rock shaft is connected by another arm and a rod with a lever pivoted on the treadle next to the standard, so as to force the casters down and raise the stand upon them when the free end is pressed down by the foot or hand of the operator. When forced down, the lever drops under a stud catch on the standard, which holds down and keeps the standard mounted on the casters.

Improved Vehicle Spring.

Ambrose L. Davis and Levi A. Davis, Port Crane, N. Y.—Springs are attached to the tee of the pole and to the bolster, and receive the blocks and bars, to which the fifth wheel is attached, and upon which the wagon body rests, being confined by the king bolt. The springs act in connection with the other springs of the running gear, and add materially to the elasticity of the wagon body. The clip block, by means of which the ordinary springs are confined to the axle, has a clip which passes around the latter, through the block, and through the spring. The ends of the block extend from this clip in each direction, and each receives a clip for giving additional support to the spring.

Improved Strainer for Milk Pails.

Conrad Schambra, Wheeling, W. Va.—This invention consists of a strainer attachment to milk cans, adapted to serve in combination with a small cap for the cover for the pail, and also adapted for the attachment of a funnel for straining and discharging the milk into a vessel having a small neck. By this device the milk can be strained at the same time that it is received from the cow into the pail.

Improved Combined Blacking Box, Blacker and Polisher.

Anson L. Sonn, Baltimore, Md.—This invention consists in a peculiar mode of covering the blacking box and supporting the blacker upon the polisher, so that the whole may be conveniently carried in their trunks by travelers, and without the possibility of soiling their clothes.

Improved Fruit Box.

Edward Wilkins, Chestertown, Md.—This invention relates to modes of constructing fruit boxes so that they will be sufficiently strong and durable to bear the jars and jolts of transportation, the weight of the fruit, and the various manipulations through which they must necessarily pass, but, at the same time, be sufficiently cheap to admit of their transfer to the consumer with the fruit and without extra charge.

Processing Hermetically Sealed Cans of Fruit, etc.

Andrew K. Shriver, Baltimore, Md.—This invention relates to methods of processing hermetically sealed cans of fruit, fish, or vegetables, so as to preserve their peculiar flavors, and consists in immersing the tight vessel in water, and then applying superheated steam to the inside of the vessel.

Improved Bale Tie.

Finis L. Bates, Winona, Miss.—This bale tie is shaped in the form of the letter U, and has legs so arranged in diagonal position to the base that the tie rests thereby on the lower corners of the same. The upper diagonally opposite corner of each leg has a spur. The ends of the loop band are slipped over the legs of the tie by being placed parallel to the sides of the same, by which no resistance is offered. The end projections keep the bands in position on the tie, and prevent thereby the detaching of the same.

Improved Scraper Attachment to Blacking Brushes.

John M. Stamps, Washington, D. C.—This invention relates to means whereby an ordinary brush for blacking and polishing boots or shoes may be made more useful and desirable to the public. The invention consists in the peculiar shape of the scraper and the mode of applying it to the brushes so as to enable it to conveniently and readily eliminate every particle of dirt, especially between the upper and sole.

Improved Cooking Utensil.

Ira Dunham, Plattsburg, Mo.—This is a cooking utensil for broiling meats, roasting coffee, and other purposes, which is readily thrown open and held tightly closed during use. Two pans of equal size are pivoted together, facing each other, and closed by a longer handle with spring extension, which takes hold of the shorter handle, and holds the same in position by a sliding clasp link.

Improved Car Coupling.

William H. Hopper, Saginaw City, Mich.—This invention consists of a bumper head, to which is pivoted at one side a strong spring dog; at the other side is a vertical loop, with wedge-shaped or pointed front edge which enters between the rounded off side of the bumper head and the spring dog of the adjoining car, so as to be firmly locked between them. For the purpose of coupling with the common drawhead and link, the bumper head is provided with a horizontal slot for admitting the link, while the pivoted clevis is detached and thrown back in sideward position, and its pin fastening made available for coupling the entering link.

Improved Rope Drum for Windlasses.

John Knowlson, Jr., Troy, N. Y.—The drum is provided with a conical friction flange at each end, and arranged loosely on the shaft, so that the latter can turn without it; also so that it can slide lengthwise to some extent. A friction disk is keyed fast to the shaft. For clutching the drum to the shaft, suitable mechanism presses a loose disk against the drum and the latter against the friction disk.

Improved Suspension Lamp.

Riverius Marsh, New York city.—This invention is a plate made in any form to serve as a reflector to throw the rays of light downward. The plate is fastened to the shade by means of screws which pass through a vertical flange and enter a corrugation in the shade. The plate is suspended from lamp chains, so as to serve both as a reflector and connection between the lamp and shade, allowing either to be raised or lowered.

Improved Car Starter.

Carl Ludwig Praeger, Niles, Mich.—The draw rod, when strain is applied, pulls forward a traveling carriage which moves on the drawbar. Friction rollers on the side of the carriage pass under the inclined portion of the horizontal arm of a bell crank lever, to the vertical part of which arms are secured, which are thereby forced at an angle into the ground, so pushing the car ahead.

Improved Molder's Flask.

Isaac Mc Guire, Albany, N. Y.—The upper flask section or cope is provided at the bottom part with slide pieces worked by handles under the cope plates, so as to project when ramming the sand, separating the cope from the nowel, being withdrawn when taking off both flask sections from the molded sand. The bottom flask is rammed and prepared in the usual manner for the pattern. The cope is then placed on it, with the slides pushed forward, so as to project to the inside of the cope. The sand is then rammed in over the cope section, then detached from the bottom section, and turned over for taking the follower board. The molded sand is supported on the projecting part of the slide. The cope is then reset on the nowel, the slides are drawn back, and both sections of the flask are then detached from the mold.

Improved Whiffletree Staple.

Munson Hinman, Hallock, Ill.—The loop and the strap of the staple are cast of malleable iron, in one piece. In the end parts of the strap are holes to receive the bolts by which the staple is secured to the whiffletree

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Business and Personal.

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ANSWERS TO CORRESPONDENTS

H. S. can obtain Faraday's "Experimental Researches" by applying to the booksellers who advertise in our columns.—F. W. M. will find directions for gilding on p. 90, vol. 30. Copies of patents can be obtained at this office.—R. Y. M. will find a description of wooden railroads in the United States on p. 324, vol. 29.—J. W. had better send us his instrument for finding lead, silver, and gold beneath the surface of the earth.—J. L. S. will find a description of polish for shirts on p. 27, vol. 30. We do not answer business questions in this column.—B. D. T. will find the statistics of English patents on p. 272, vol. 29.—D. B. will find directions for making paper boats on p. 163, vol. 27.—C. C. A. can preserve eggs by the recipe given on p. 378, vol. 30.—C. C. is informed that one of the best practical works on the steam engine is Bourne's "Catechism."—J. V., who wishes to become a mechanical engineer, should read Mr. Clarke's paper on p. 8 of this issue.—C. E. D. will find a description of the dynamometer he requires on p. 7, vol. 31.—J. R. will find a recipe for a cement for alabaster (which will serve for glass and china) on p. 218, vol. 26.—J. C. C. is informed that wood rollers can be kept from checking by the process detailed on p. 283, vol. 30.—S. R. H. can prevent rust on steel tools by the recipe on p. 234, vol. 27.—H. W. can blue a gun barrel by following the directions on p. 10, vol. 25.—F. J. D. can drive away cockroaches by the means described on p. 107, vol. 30.—R. W. will find full directions for case hardening on p. 122, vol. 30.—O. P. will find a recipe for aquarium cement on p. 90, vol. 30.—J. H. T. should not believe the mineral rod men. There is no truth in any of their pretensions.—We are obliged for A. B.'s reply to the horse and man problem, which we had anticipated in our editorial pages last week.

W. T. R. asks: 1. How are the battery wires connected with an electromagnet, so as to make the armature vibrate as long as the current continues? I wish to attach one to a clock alarm. A. The armature is fastened to a brass rod, as in a telegraph relay; this arm or lever, with the aid of a spring, serves to hold the armature a short distance from the cores of the magnet when the current is not passing. The wire, as it leaves the magnet, is placed in metallic communication with this lever; the wire from the other pole of the battery is attached to a small brass standard, which is placed in such a position that when the current is not passing the spring attached to the small lever draws it back against the standard, thereby completing the circuit, charging the magnet, which in turn attracts the armature, thus breaking the circuit, when the whole operation is again and again repeated. 2. How many feet of No. 15 copper wire will it take to make an induction coil for an electromagnetic machine for medical purposes? What number of wire and what length is best for the primary coil? A. See p. 379, vol. 30.

A. W. says: Can I make cook stove patterns of some alloy, that will run perfectly in molds of plaster of Paris and wood? A. Try white metal as follows: 86 parts by weight of tin, 10 antimony, 3 zinc, 1 copper.

F. T. says: A gentleman having a spring some 60 rods from his house wished me to lay a pipe from it to supply his house and barn. I commenced at the spring to lay the pipe, not letting the end into the water until I had made all connections, and running it to the house with some 30 feet fall. I then carried it into the kitchen over the sink, 5 feet high, bending it in a semicircle and running down again through the floor underground, some 6 rods to the barn, sinking a barrel for it to discharge into after running through the house. On the pipe, 16 inches from the circle or bend, I put a cock to draw for the use of the kitchen, this being on the side next to the spring. But to my surprise, when placing the end of the pipe into the spring, the water would run past the cock which I had inserted below the bend, rise 16 inches higher, and run down the other side of the barn. This I could only remedy by placing a stop cock on the opposite side of the circle and shutting it every time I wished to draw from the faucet. Not one drop of water would come out of the faucet without this. A. Such an occurrence is very common. You have got a siphon there. You can readily fit a two-way cock for the house faucet, which will shut off the discharge into the barn, when opened into the kitchen.

A. B. asks: How is black copperplate printing ink made? A. Take linseed oil 1 pint, boil out of doors in a dry saucepan till it will ignite on applying lighted paper, let it burn 10 minutes, then put the lid on, and the flame will go out. Stir in ½ oz. litharge. When cool, grind into a paste with lamp black, using a muller.

W. H. S. asks: I. How can I make a white linen or cotton waterproof without covering the texture or discoloring the linen? What kind of varnish or other transparent substance will give linen adurable finishing polish after being thus treated? A. A good colorless varnish is made by dissolving 2½ ozs. shellac in a pint of rectified spirits of wine; boil for a few minutes with 5 ozs. well burnt and recently heated animal charcoal. Add more charcoal if necessary to make the varnish white. Filter through blotting paper. 2. How can I make an adhesive substance that will not discolor white linen? Try gum trugacanth mucilage, adding a few drops oil of cloves to prevent putrefaction.

C. D. R. asks: What are "bastard cut," "smooth cut," "superfine cut," and "dead smooth" files? A. Bastard cut files are coarse ones used for roughing work out. Second cut are for roughing out hard metal. Superfine cut are for making very smooth surfaces. Fine cut are for ordinary smooth surfaces. Dead smooth are for very fine surfaces to be highly polished, the latter saving much labor in polishing.

A. S. & Co. ask: How can we prepare sweet cider so that it will remain sweet for several months? Can it be so prepared that it will bear transportation without fermentation? We notice that cider will ferment in a short time, even in freezing weather, when agitated by the motion of the cars. A. Perhaps the best method is that of thoroughly charing the insides of the casks, and racking off the cider a number of times.

E. A. B. says: Some four years ago the ship Pomona was lying in Montreal deeply laden. Five or six strong tow boats tried for three days to tow her up, but were unsuccessful. One of the Allan steamships then took her in tow, as she was going up the current, and, unaided, walked her along without the slightest difficulty. The steamships always ascend the current (which runs at 10 knots) at half speed. The question is: Was not the extra weight of the steamship a power in the case? I should state that the aggregate steam power of the tugs was greater than that of the steamship. To simplify the case, cannot a man in a boat of 25x5 feet tow a boat of 12x4 feet with greater ease than he can in a 12x4 boat tow one of 25x5? I know by experience that he can do so, but I should like to know what law of force in motion governs the case. I want to know if inherent weight is not a power in the towage of smaller vessels in which weight is equally concentrated in proportion to the displacement of water? A. We think that the sole advantage possessed by the large steamer was in the fact that her screw, being more deeply immersed, was not working in such a swift current as the smaller ones, and acted more efficiently. There was no gain in the increased weight.

A. D. D. asks: How can I repolish surgical instruments after grinding them on a lead wheel with flour of emery? A. Nothing polishes any metal better than crocus cloth, used on the article until it is covered with a face of the metal itself. The more the crocus is used, the better it is for polishing.

G. A. A. asks: If my lightning rod is painted, does the paint lessen its usefulness as a conductor? A. No.

W. W. asks: 1. Is there any loss in reciprocating motion as compared with rotary motion? If so, how can an engine run half a mile and back in the same time with the same power that another can run a mile ahead? If this is not a fair illustration, will you please explain how it is? A. We do not understand what you mean. 2. Is it not possible that we may have a liquid fuel that will be as cheap and much more convenient than coal, even if it has to be procured from coal? A. It is possible.

H. E. S. says: I have a fish net made of cotton twine, which remains in fresh and sometimes muddy water for two or three months at a time; what should it be immersed in (so as not to lose its flexibility) to best preserve it from decay? A. Steep your net in melted paraffin.

G. R. E. asks: How can I melt white vulcanized rubber in order to make castings? A. You cannot melt such rubber satisfactorily. Dissolve it in naphtha or else use the pure gum rubber.

J. M. E. asks: What is the commercial importance of black lead? A. Largely used in the manufacture of crucibles, lead pencils, as a lubricant, stove polish, etc.

C. C. M. I. asks: 1. Do you know of a manure or fertilizer which is soluble in water and which is of advantage in growing tobacco? A. We have used sulphate of ammonia to stimulate growing plants, and very successfully. We should therefore suggest its employment for tobacco. Other soluble salts of ammonia would answer, but this has the advantage that it is contained in the ammoniacal liquor of gas works and can be obtained in large quantity if needed. 2. Can you give me a recipe for making an amalgam for an electric machine? A. Melt together in a crucible 2 drams of zinc and one of tin; when fused, pour them into a cold crucible containing 5 drams of mercury. The cushions should be rubbed with a mixture of tallow and beeswax before applying the amalgam. 3. Is it also necessary to have the plate for the machine entirely smooth around the edge? A. Not absolutely necessary. 4. What is the proper temperature of water for bathing? A. A little colder than the temperature of the body.

J. W. P. asks: Why is it that an explosion is liable to take place during the loading of a cannon, if the vent is not closed? A. Explosions of this kind are due to particles of ignited carbon remaining in the gun. The closing of the vent partially stops the supply of oxygen, and this hastens the extinguishing of the carbon. In cases where the firing is continuous and hasty, these premature explosions are liable to occur, even though the vent be closed.

T. J. H. says: 1. We have a tree, the first fork of which is six feet from the ground. As the diameter of that tree increases year after year, will the distance between the ground and said fork also increase or not? A. The increase is only by interstitial lateral growth. The distance from the ground remains precisely the same. 2. It is a settled fact that carrying Irish potatoes in the pantaloons pocket cures rheumatism. Why is this? Why do said potatoes, when so worn, become as hard as stones instead of decaying? A. Curious, if true. Warmth without dampness will gradually desiccate a tuber like a potato, until it becomes very hard. Warmth and moisture will cause decay, and it is to be hoped that these circumstances do not conspire in the case mentioned.

G. S. B. says: I have tried the recipe, given in your No. 20, for making French polish, namely, dissolving shellac and sandarac in naphtha, and I find that naphtha does not have the least effect on either. A. Take the best pure white shellac and dissolve in alcohol (fourth proof); add a little gum sandarac. The fineness of the polish depends entirely upon the manner and skill with which it is applied.

G. H. M. asks: 1. How can I prevent a teakettle from turning the water brown by rusting? A. Keep an oyster shell in the bottom of the kettle; and when water is wanted, pour off without agitating the vessel. Be careful also not to let the water stand in the vessel when not in use. 2. What is the weight of one cubic foot of air near the earth? A. 100 cubic inches of air, at 60° Fah. and 30 inches barometric pressure (which may be taken as expressing the mean average condition of the atmosphere at the earth's surface), is 31·074 grains. Hence a cubic foot under the same circumstances will weigh 586·95872 grains.

F. E. C. asks: What metal with which hydrogen gas comes in contact produces flame sufficient to ignite gas? A. Platinum in a state of fine division, when it is called platinum black or platinum sponge.

C. T. asks: 1. How is the paper for printing decalcomanie prepared? A. Treat it with albumen. 2. What can I use to make tin look a bright gold color? A. Varnish it with shellac.

G. R. asks: I am manufacturing an article of 100 parts copper and 60 parts zinc. It is just about the quality of brass I require, but it has the appearance of yellow brass. Is there not some metal which I could add to the mixture to give it a richer and more coppery color? A. There is no way except by increasing the percentage of copper.

H. H. H. A. asks: 1. What is a simple way to color or bronze a gun to keep it from rusting? A. Dissolve 2 parts of crystallized chloride of iron, 2 parts solid chloride of antimony, and 1 part of gallic acid in 4 or 5 parts of water. Apply to the gun barrel with a sponge. Let it dry in the air, and repeat the operation several times; then wash with water, dry, and rub with boiled linseed oil. The shade deepens according to the number of times the operation is repeated. 2. What material is the best for gun wads? A. A specially made felt is used for this purpose. 3. How can I make glycerin? A. See p. 347, vol. 30.

L. says: In your issue of March 28, you give a recipe for dissolving rubber in turpentine. I have tried it in turpentine, bisulphuret of carbon, ether, and benzine, hot and cold, in bath and without, and could never succeed. I send you a piece of the rubber. A. Your sample dissolves in all of these, and partially in naphtha and benzine.

C. S. asks: 1. How is milk brought into a state of fermentation? A. After the milk has curdled, add powdered chalk until all the lactic acid is taken up and repeat the operation as the fermentation proceeds. 2. How can butyric acid fermentation be stopped? A Try powdered alum.

G. R. asks: How can I dissolve boracic acid so that it will remain in solution? I tried 1 part acid to 8 of boiling water, but it precipitated on cooling. A 100 ozs. of water at 75° Fah. will dissolve 13¾ ozs. of boracic acid. Your other queries were answered last week.

T. C. H. asks: In doing fine work such as engraving, will it be more injurious to the eyes to use spectacles of tolerably strong magnifying power, than an ordinary eye glass and stand, such as is generally used for that purpose? A. Whenever strong magnifying powers are used, the eyes require corresponding long periods of repose to prevent injury.

A. T. B. asks: How is phosphorus dissolved previous to being applied to the match? How are the matches dipped? Is there any danger in the process? A. The preparation is different according as they are chemical or lucifer matches. For chemical matches, put 40 grains of phosphorus in a wide-mouthed bottle. Add enough oil of turpentine to cover the phosphorus; then mix in 10 grains of flowers of sulphur. Put the bottle into hot water until the phosphorus is entirely dissolved; stop the mouth of the bottle with a cork, and well shake the whole until it has become cold; afterwards pour off the supernatant oil of turpentine. Into the mixture of phosphorus which remains in the bottle, dip the extremities of the matches; and after some time, when they have become dried, drop them into the following mixture: Dissolve 30 grains gum arabic in a small quantity of water; add to it 20 grains of chlorate of potash, and mix them intimately together; then add 10 grains of soot previously mixed with a few drops of spirits of wine. In about 20 hours, the matches will be perfectly dry, when they will ignite on rubbing them over a rough surface. For lucifer matches, use one third of phosphorus, and the remainder of gum arabic, water and coloring matter like minium or Prussian blue. Mix in a water bath and muller carefully. The dipping is performed in the following manner: The melted composition is spread upon a board covered with cloth or leather, and the workman alternately dips the two ends of the matches, that are fixed in a frame. The fumes are very poisonous.

H. L. E. says, in reply to P. S. S. who asked whether Cornell University is a good school for mechanical engineering: There is connected with Cornell an extensive mechanical and machinery department, fully equipped with some of the finest machinery and tools to be found in any shop in the country, and where instruction in practical mechanics is given by the most efficient professors. The study forms an important part of the course required of the student, and gives a proficient an opportunity to earn something towards his own support.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Color of Light. By M. O. N.

On Veaucellier's Parallel Motion. By S. N. M.

On the Transit of Venus. By R. D. W.

On Screw Propellers. By J. E. W.

On the Sun's Attraction. By C. T.

On the SCIENTIFIC AMERICAN. By K. M. J.

Also enquiries and answers from the following:

H. P.—T. J. W.—S. L.—J. C. C.—F. H. D.

Correspondents in different parts of the country ask: Who publishes a book on raising gold fish? Who sells a motor for light machinery, other than a steam engine? Who sells small engines for boats, so simple that an amateur can run them? Who makes adding machines? Who makes the best brick machine? Who has a patent apparatus or system for blasting rock? Who makes the best turbine water wheels? Who sells the best lathe for turning hammer handles? Who makes stump pullers? Who makes steam engines, as small as 2x3 inches in the cylinders? Who sells machines for forming and coating pills? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

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FOR WHICH

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June 2, 1874,

AND EACH BEARING THAT DATE.

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Watch regulator, J. W. Hurd 151,587
Watches, adjustable cap for, W. W. Stewart 151,516
Water from steam, separating, B. J. Hobson 151,664
Window screen, T. Kells 151,599
Wrench, Ubelleger & Hoffliger 151,655
Wrench pipe, J. B. Westwick 151,559

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

29,908.—MOLDING METAL PIPES.—H. Parmelee. Aug. 19.
29,917.—SELF ACTING DRAWBRIDGES.—L. Schneider *et al.* August 19.
29,920.—MORTISING MACHINE.—H. C. Smith. August 19.
29,923.—PLANING MACHINE.—H. D. Stover. August 19.
30,030.—STEAM ENGINE.—W. Wells. August 26.

EXTENSIONS GRANTED.

28,338.—GRAIN BINDING MACHINE.—D. W. Ayres.
28,633.—MARKING CLOTH.—H. W. Fuller.

DESIGNS PATENTED.

7,463.—DRAWER PULL.—A. D. Judd, New Haven, Conn.
7,464.—WASH BASIN.—J. R. Lancaster, New York city.
7,465.—SINK.—J. R Lancaster, New York city.
7,466.—WASH BASIN.—J. R. Lancaster, New York city.
7,467.—SHELF BRACKET.—A. H. Lowell, Manchester, N.H.
7,468.—STOVES.—J. S. Perry *et al.*, Albany, N. Y.
7,469.—CARPETING.—J. Fisher, Philadelphia, Pa.
7,470.—DRAWER PULL.—J. Girard, New Britain, Conn.
7,471 to 7,474.—CARPETS.—H. Kerr, Philadelphia, Pa.
7,475 & 7,476.—CARPETINGS.—H. S. Kerr, Philadelphia, Pa.
7,477 & 7,478.—CARPETS.—H. S. Kerr, Philadelphia, Pa.
7,479 & 7,480.—CARPETS.—W. Kerr, Philadelphia, Pa.
7,481.—IRON FENCES.—S. Turnbach, Bloomsburgh, Pa.
7,482.—CARPETS.—W. F. Walt, Auburn, N. Y.

TRADE MARKS REGISTERED.

1,811.—COLOR MORDANT.—Burgess *et al.*, Woonsocket, R.I.
1,812.—HAMS, ETC.—P. T. George & Co., Baltimore, Md.
1,813.—MEDICINE.—W. C. Hamilton & Co., Cincinnati, O.
1,814.—LIQUID POTASH.—Holman *et al.*, New York city.
1,815.—CIGARS, ETC.—T. H. Messenger & Co., N. Y. city.
1,816.—SOAPS.—S. W. McBride & Co., Chicago, Ill.
1,817.—SMOKED & OTHER MEATS.—I. Michener, Phila., Pa.
1,818.—CIGARS.—L Moss, Chicago, Ill.
1,819.—KNIT GOODS.—Plainville M'f'g Co., Plainville, Ct.
1,820.—PLASTERS.—L. W. Warner & Co., New York city.

SCHEDULE OF PATENT FEES.

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On application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA

MAY 26 to 29, 1874.

3,472.—W. H. Beckwith, Ottawa, Carleton, Ont. Improvements on heating, cooking, and ventilating apparatus, called "Beckwith's Heating, Cooking, and Ventilating Apparatus." May 26, 1874.

3,473.—S. S. Putnam, Boston, Suffolk county, Mass., U. S. Improvements on machines for making wrought nails, called "Putnam's Wrought Nail Machine." May 28, 1874.

3,474.—T. Foley, Brantford, Brant county, Ont. Apparatus and process for manufacturing extract for tanning and other purposes from hemlock, oak, and other bark and substances containing tannin, called "Foley's Non-Vacuum Apparatus and Process for Obtaining Bark Extract." May 28, 1874.

3,475.—S. P. Leake, London, Middlesex county, Ont. Improvements on bedsteads, called "Leake's Improved Bedstead." May 28, 1874.

3,476.—E. P. Morong, Boston, Suffolk county, Mass., U. S. Improvements on method of laying and preserving wood pavements, called "Morong's Method of Laying and Preserving Wood Pavements." May 28, 1874.

3,477.—E. Myers, New York city, U. S. Improvements on rotary pumps, called "Myer's Rotary Engine." May 28, 1874.

3,478.—M. Wainman, South Orillia, Simcoe county, Ont. Churning Machine, called "Weinman's Churning Machine." May 28, 1874.

3,479.—J. W. Elliot, Toronto, York county, Ont. Improvements in heating stoves, called "Elliot's Fuel Saver." May 28, 1874.

3,480.—J. Taylor, Hamilton, Wentworth county, Ont. Improvements on railway freight cars, called "Taylor's Improved Box Car." May 28, 1874.

3,481.—J. A. Moffat, Dundas, Wentworth county, Ont. Improvements in a machine for stoning cherries, called "Moffat's Improved Machine for Stoning Cherries." May 23, 1874.

3,482.—W. T. Kellogg, Troy, Rensselaer county, N. Y., U. S. Improvements on portable forges for blacksmiths, called "The Empire Fan Blowing Portable Forge." May 28, 1874.

3,483.—W. Quinlan, Mayfield, Santa Clara county, Cal., U. S. Improvements on a tripartite tie link for chains, called "Quinlan's Tripartite Tie Link for Chains." May 28, 1874.

3,484.—J. Bennett, Belleville, Ont. Improvements on a fanning mill and separator, called "Bennett's Improved Ockerman Fanning Mill and Separator." May 28, 1874.

3,485.—William W. Allmand, East Boston, Suffolk county, Mass., U. S. Improvements on valve refitting machines, called "Allmand's Valve Refitting Machine." May 28, 1874.

3,486.—C. Cole, Meriden, Sullivan county, N. H., U. S. Improvements on a machine for washing, called "C. Cole's Excelsior Washer." May 28, 1874.

3,487.—J. T. Cocking, Penzance, Cornwall county, Eng. Improvements in the manufacture of corsets or stays and other articles of wearing apparel, called "The Poro-Plastic Corset." May 23, 1874.

3,488.—G. N. Torrence, Philadelphia, Philadelphia county, Pa., U. S. Improvements on combined mattress and life preserver, called "Torrence's Life Saving Mattress." May 23, 1874.

3,489.—P. Cadell, Victoria, Vancouver's Island, British Columbia. Combination of machinery and apparatus for the extraction of gold from auriferous gravel materials, called "The American Gold Washing Sluice or Flume, with Power Sifting." May 28, 1874.

3,490.—J. B. Wills, Montreal, P. Q. Improvements on horseshoe nail machines, called "Wills' Improved Dodd Machine." May 28, 1874.

3,495.—G. W. McCready, Village Petitcodiac, Westmoreland county, N. B. Improvements on boring machines, called "The Victor Boring Machine." May 28, 1874.

3,497.—F. A. H. La Rue, Quebec, P. Q. Un nouveau et utile perfectionnement dans la concentration des pyrites de cuivre et autres pyrites. ("La Rue's Method and Process for Cleaning and Concentrating Copper and Other Pyrites.") May 29, 1874.

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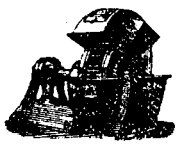

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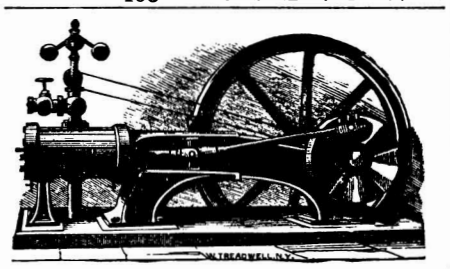

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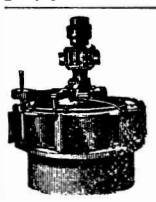

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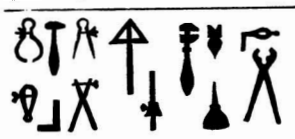

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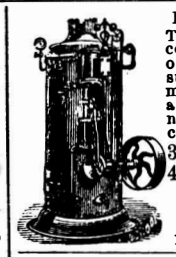

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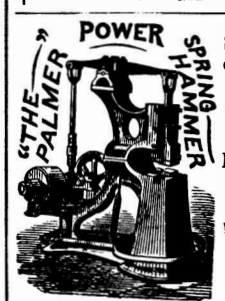

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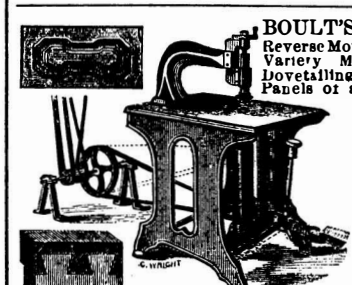

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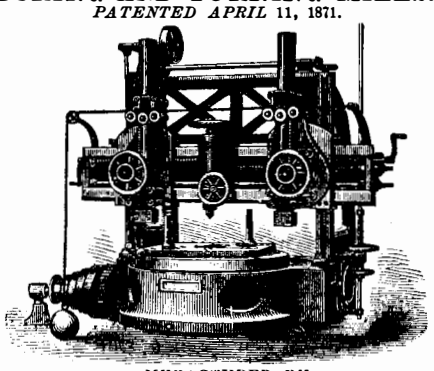

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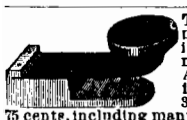

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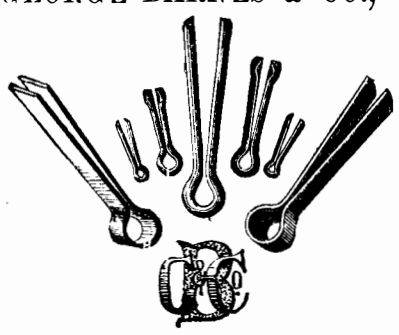

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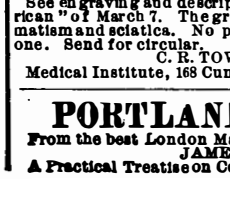

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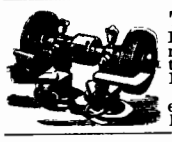

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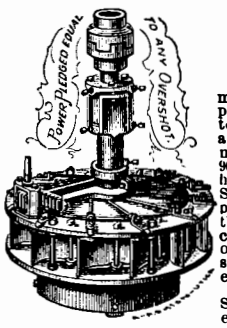

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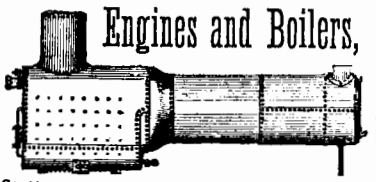

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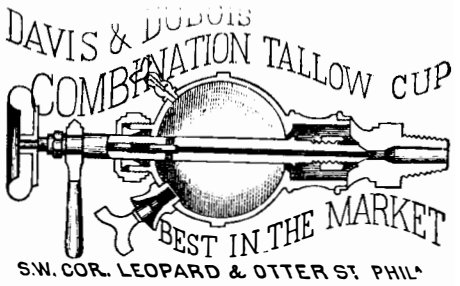

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